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**AUGUST 1944**

# **THE BULLETIN**

**OF THE**

**U. S. Army Medical Department**

**A periodical containing original articles, reviews, news, and  
abstracts of interest to the Medical Department of the Army**

**ISSUED UNDER THE AUSPICES OF  
THE OFFICE OF THE SURGEON GENERAL**

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**PUBLISHED MONTHLY AT THE MEDICAL FIELD SERVICE SCHOOL,  
CARLISLE BARRACKS, PENNSYLVANIA**

By direction of the Secretary of War, the material contained herein is published as administrative information and is required for the proper transaction of the public business.

**NORMAN T. KIRK**  
Major General, U. S. Army,  
The Surgeon General.

NUMBER 79

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OFFICE OF THE SURGEON GENERAL,  
WASHINGTON 25, D. C.

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## Foreword

With the October 1943 issue, The Bulletin became a monthly periodical, instead of a quarterly, dedicated to keeping the personnel of the Medical Department informed on developments in war medicine. The new publication, known as The Bulletin of the U. S. Army Medical Department, absorbed the former quarterly dental and veterinary bulletins and will have material devoted to those fields in each issue.

The Bulletin is intended to be educational rather than directive in nature. It will contain the best information obtainable concerning military medical experience, observations, and procedure that may help to improve further the quality of professional services. The Bulletin will be a medium whereby experience gained in one theater of combat may be shared with those serving in other combat areas and with those in this country who are preparing for overseas duty. News items concerning military and scientific developments as well as original articles will be emphasized. The Bulletin, however, should not serve as a basis for the forwarding of requisitions for equipment or supplies referred to therein.

Obviously, some of the most interesting field experiences cannot be divulged in a periodical of this kind when our country is at war. The Bulletin will, however, publish that which can be safely told, drawing not only on current literature, but on many authoritative reports which reach The Surgeon General's Office from the field. Officers are invited to submit for publication reports of their field experiences that can profitably be shared with other officers.

The Medical Department has been commended for its work in caring for the sick and wounded in theaters of operations in war. The Bulletin will endeavor to stimulate such progress and to advance further the high standard of medical service in the Army of the United States.

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## Notice to Contributors

Contributions to The Bulletin should be typewritten, double spaced, with wide margins, and in duplicate including the original and one carbon copy. Great accuracy and completeness should be used in all references to literature, including the name of the author, title of article, name of periodical, with volume, page, and number—day of month if weekly—and year. Materials supplied for illustrations, if not original, should be accompanied by reference to the source and a statement as to whether or not reproduction has been authorized. Adequate legends should accompany each illustration in order to point out clearly to the reader the condition or lesion or other objectives, which in some instances should be indicated by a small arrow or other device. Each illustration and table should bear the author's name on the back; photographs should be clear and distinct; drawings should be made in black ink on white paper. Original articles will be accepted for publication on condition that they are contributed solely to The Bulletin and that editorial privilege is granted in preparing the material submitted for publication. Reprints may be ordered for official use. Arrangements for reprints for personal use may be made direct with the Book Shop, Medical Field Service School, Carlisle Barracks, Pennsylvania. The type will be held for two months following publication.

## News and Comment

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### SANDFLY FEVER

The Commission on Neurotropic Virus Diseases of the Board for the Investigation and Control of Influenza and Other Epidemic Diseases sent two of its members to Egypt and North Africa where a laboratory and experimental ward were established and maintained for several months and where members of the Commission made field observations on epidemics of sandfly fever among American troops in Egypt, Persia, and Sicily. Studies carried out in the Middle East laboratory revealed that the virus contained in the serum of patients during the first twenty-four hours of the disease readily reproduced the disease in human beings. Most of the American soldiers who volunteered for these experiments were awarded the Legion of Merit. Sandflies (*Phlebotomus papatasi*) reared in the Commission's laboratory transmitted sandfly fever from infected to normal human beings, while mosquitoes (*Culex pipiens* and *Aedes aegypti*) collected in an epidemic area and fleas (*Pulex irritans*) obtained from native clothing did not. Several strains of virus from the Middle East and Sicily were brought back to the United States where Major Albert B. Sabin, M.C., a member of the Commission, repeatedly reproduced sandfly fever in additional human subjects.

The annual report of the Commission, covering the period of 1 May 1943 to 1 April 1944, states that the following new facts have been learned: (1) sandfly fever is easily reproducible; (2) the virus is found in the blood at least twenty-four hours before the onset of fever, during the first twenty-four hours of fever, but no longer than forty-eight hours after onset; (3) the virus has been passaged in series seven times by the inoculation of serum from human being to human being without any apparent change in its properties; (4) the dose of the virus (i.e., infected serum) which produced the disease when inoculated intravenously or intracutaneously in 95 percent of human adults failed to produce the disease in 50 to 75 percent of individuals in simultaneous tests when the inoculation was given subcutaneously or intramuscularly; (5) the size of the virus as determined by gradocol membrane filtration tests falls into the same range of magnitude as that of yellow fever which is 22 millimicra; (6) all animal inoculations with this virus have been negative. Some inoculations of the third and fourth passage chick-embryo cultures have not reproduced the disease.

### SMALLPOX VACCINATION

Twenty-three cases of smallpox with five deaths have occurred among military personnel in China-Burma-India and seven cases with one death in the Persian Gulf Command between 1 January and 1 May 1944. The reported faults are the use of vaccine close to or past the expiration date, improper refrigeration of vaccine, and faulty technique such as the use of strong antiseptics to clean the arms. All of the severe cases and several mild ones occurred in persons who had never been successfully vaccinated or in those whose scar was due to vaccination in childhood. In every case the immunization register showed the entry "immune" under reaction, often of recent date. These really represented complete failure of the vaccination to take. The patients usually stated that the vaccination was not inspected or was inspected five to seven days after vaccination.

Apparently some medical officers assume that an immune reaction occurred in all cases not having vaccinia or vaccinoid reaction. Accordingly, entries of "immune reaction" have been made on immunization registers as a result of an inspection made a week or more after vaccination. The "immune reaction" is characterized by the development of a papule and a small area of redness usually within the first twenty-four hours after vaccination. The peak of the reaction is passed within three days, although a small brownish-red area may persist for a week. The inspection of arms a week or more after vaccination will differentiate vaccinia and vaccinoid reactions but will not differentiate immune reactions from failures to take. Inspection two to three days after vaccination is necessary for such differentiation. Entries of immune reaction on immunization registers should not be made unless the reaction actually has been observed about two to three days following vaccination. Failure of any reaction to develop usually indicates either poor technique of vaccination or the use of vaccine virus which has lost its potency. Revaccination of individuals not known to be immune reactors should be done as often as is necessary.

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### MEDICAL SOLDIERS ON BOUGAINVILLE

Fifty Medical Department soldiers were wounded and five killed in thirty-four days' fighting on Bougainville. This was the highest casualty rate in proportion to their number in the entire 37th Infantry Division. When a wounded soldier calls for help, it is the aid man who leaves his foxhole and crawls to him, often in the face of Japanese guns. Medical soldiers have saved and are saving many lives in jungle battles. Corporal John A. Wryals of Miami, Florida, was awarded the Distinguished Service Cross for bravery under fire in the New Georgia Campaign, and Corporal Otto J. Schrader of Schulenburg, Texas, received the Distinguished Service Cross for gallantry in action on New Georgia Island.

**CIVILIAN MEDICAL CONSULTANTS**

The War Department announced on 5 June the appointment of nineteen civilian physicians as advisers to the Army Medical Department on problems of internal medicine. The advice of these consultants will supplement that afforded by the special consultants selected from officers in the Medical Corps of the Army and will be carried on through the Medical Department's chief consultant in medicine, Brigadier General Hugh J. Morgan. The consultants appointed, in eight special fields of internal medicine, are:

- Dr. Robert Cooke, assistant professor of clinical medicine, Cornell University, New York (allergy)
- Dr. Francis Rackemann, physician, Massachusetts General Hospital, Boston (allergy)
- Dr. Robert Levy, professor of clinical medicine, Columbia University College of Physicians and Surgeons, New York (cardiovascular diseases)
- Dr. Paul White, chief of Cardiac Clinics and Laboratory, Massachusetts General Hospital, Boston (cardiovascular diseases)
- Dr. Chester Keefer, professor of medicine, Boston University School of Medicine, Boston (chemotherapy)
- Dr. Chester Jones, clinical professor of medicine, Harvard Medical School, Boston (gastro-enterology)
- Dr. Walter L. Palmer, professor of medicine, University of Chicago School of Medicine, Chicago (gastro-enterology)
- Dr. Colin MacLeod, professor of bacteriology, New York University College of Medicine, New York (infectious diseases)
- Dr. Charles E. Smith, professor of public health and preventive medicine, Stanford University School of Medicine, San Francisco (infectious diseases)
- Dr. Carol B. Thomas, associate in medicine, Johns Hopkins University, Baltimore (infectious diseases)
- Dr. Barry Wood, professor of medicine, Washington University, St. Louis (infectious diseases)
- Dr. J. Gardner Hopkins, professor of dermatology, Columbia University College of Physicians and Surgeons, New York (skin diseases)
- Dr. John Stokes, director, Institute for Control of Syphilis, University of Pennsylvania, Philadelphia (skin diseases)
- Dr. Mark F. Boyd, director of the Station for Malaria Research, Tallahassee, Fla. (tropical diseases)
- Dr. Harold W. Brown, professor of parasitology, Columbia University, New York (tropical diseases)
- Dr. James A. Shannon, assistant professor of medicine, New York University College of Medicine, New York (tropical diseases)
- Dr. Robert B. Watson, principal malariologist, Tennessee Valley Authority, Chattanooga, Tenn. (tropical diseases)
- Dr. J. Burns Amberson, professor of medicine, Columbia University College of Physicians and Surgeons, New York (tuberculosis)
- Dr. James J. Waring, professor of medicine, University of Colorado School of Medicine, Denver (tuberculosis)

### MEDAL FOR SCRUB TYPHUS CONTROL WORK

The Bronze Star Medal has been awarded to an officer of the Sanitary Corps and seven enlisted men of the Medical Department for their services in the prevention of scrub typhus on Goodenough Island in the South Pacific, as announced on 16 May 1944 by Sixth Army Headquarters.

Although these men were fully aware of the danger of contracting scrub typhus, they voluntarily applied themselves to the task of preparing camp sites in order to bring about the rapid and complete control of this disease on Goodenough Island. Their services were rendered during the periods 27 December 1943 to 7 February 1944 and 13-22 March 1944.

The awards were made to Captain Charles Lose, III, East Cranford, New Jersey; Staff Sergeant John O. Beasley, R.F.D. 6, Charleston, West Virginia; Sergeant William G. Osborn, Bronx, New York; Technician Fourth Grade Joseph S. Burat, Swedesburg, Pennsylvania; Technician Fourth Grade Joseph H. Downing, Cranford, New Jersey; Corporal Stephen P. Findeis, Linden, New Jersey; Technician Fifth Grade Nicholas A. Barbarotto, Bronx, New York; and Technician Fifth Grade William M. Stokes, West Collingswood, New Jersey.

The prevention and control of scrub typhus were discussed in a special article in *The Bulletin* in May 1944. Further discussion of this subject appears in War Department Technical Bulletin TB MED 31, dated 11 April 1944, which was distributed to all medical officers.

### DEVICE FOR WASHING MESS KITS

The facilities for washing mess kits at an air base in the Southwest Pacific Area had to be enlarged to accommodate additional personnel. The flight surgeon reports that the apparatus to be described proved entirely satisfactory for the larger load.

Two 55-gallon drums were inclosed in a steel stove heated by a wood fire. The drums were piped in parallel and water was admitted to the bottom of them from the water mains by opening a valve. At the top of the drums the outlet was connected to a swinging pipe which formed a radius of a semi-circle of nine half-drums (oil), any one of which could be easily filled with hot water by rotating the swinging pipe and admitting cold water to the bottom of the heater. The half-drums were easily emptied by removing a plug at the bottom, the drainage being caught by a semicircular concrete trench and carried away to a grease trap. This apparatus would furnish in twenty minutes 110 gallons of very hot water which would remain hot until too dirty for further use. The ease of replacing the water encouraged frequent changes.

A second grease trap was installed in series with the first one and a concrete apron for the drain was built to wash out the garbage cans.



### PORTABLE CEREBELLAR HEADREST

The surgery of wounds of the occipital and cervical regions is simplified by the cerebellar headrest. This is usually an accessory of the operating table with which larger hospitals are equipped. In more advanced hospitals, however, such elaborate equipment often is not available. The substitute headrest described here by Captain Everett F. Hurteau, M.C., A.U.S., is constructed

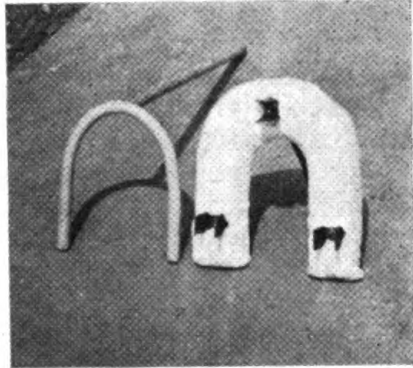


FIGURE 1

of material easily obtainable even in the most forward areas and may be used in conjunction with the standard operating-room equipment of forward hospitals.

The two parts of the portable headrest are shown in figure 1. The "horse shoe" is made of  $\frac{3}{8}$ -inch wood, padded on one side with orthopedic felt and covered with waterproof material. The opposite side is reinforced with a similarly shaped piece of sheet metal and to it three U-shaped lugs are attached. These hold the "horse shoe" in place on the stand. The latter is made of two pieces of pipe with outside diameter corresponding to the hole in the base of a "Mayo" instrument table, as shown in figure 1.

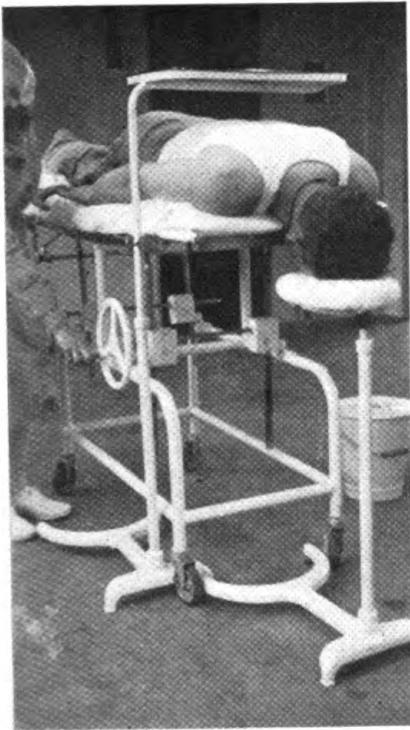


FIGURE 2

Figure 2 shows the portable headrest in use. The upper part of a "Mayo" instrument table is removed from its base and replaced by the headrest. Adjustments may be made at the thumbscrew in the "Mayo" stand and at the wheel on the field operating table indicated by the nurse (figure 2).



FIGURE 3

### WHITE PHOSPHORUS BURNS

Many casualties have resulted from burning phosphorus both in training and in actual combat. White phosphorus is used as an incendiary, a screening smoke, and for other purposes. The first-aid treatment for white phosphorus burns consists in quickly and effectively scraping the phosphorus particles from clothing and removing them from the bare skin. Particles of phosphorus that have lodged in or penetrated the skin should be kept wet with wet dressings or an extremity may be submerged in water. If the wounds are not kept wet, the phosphorus will begin to burn again, liberating phosphoric acid and increasing the severity of the burn. The *Medical Bulletin*, Chief Surgeon's Office, E.T.O., 1 June, states that 3 to 10 percent copper sulfate solution should be used immediately after the wet dressings. The phosphorus particles are colored and extinguished by the copper sulfate solution and then may be removed with forceps. Copper sulfate is not a treatment measure and is used only in first aid. After the particles of phosphorus are removed, the treatment of the burn is the same as for thermal burns of like degree.

### BLIND WORKERS CONTRIBUTE TO WAR PRODUCTION

Blind workers will produce in shops operated by them more than 60 percent of the 5,000,000 corn brooms and all of the 4,500,000 cotton mops to be procured this year by the Quartermaster Corps to keep Army buildings clean. These 2,500 workers will also produce about 1,200,000 mop handles for the Army. No procurement of these articles is to be made from other sources until all production of the blind has been exhausted. The price to be paid for these items will be determined by a committee comprising representatives of The Quartermaster General's Office, the American Foundation for the Blind, the Navy, the Departments of Interior, Commerce, and Agriculture, and the Treasury.



Marines wounded in the landing on Tarawa being towed by their comrades to larger vessels which took them to base hospitals. Official U. S. Marine Corps photograph.

### QUALITY OF MILK PRIOR TO PASTEURIZATION

Surveys have shown that in some localities from which the Army is procuring Type II, No. 1, milk, the local control officials are relying entirely on the methylene blue reductase test to determine that raw milk accepted for pasteurization meets the requirements for Grade A milk. This test is of great value as a method of estimating roughly the progress of deterioration due to bacterial multiplication; however, it is only an indicator of a definite amount of bacterial activity in milk under definitely prescribed conditions and should not be expected to correlate closely with the plate count. This test should be used only as a supplement to the bacterial plate count in milk control work. In some instances where this test is used, the milk received for pasteurization has a bacterial plate count averaging in excess of one million per ml. Pasteurized milk processed from such milk does not meet the intent of the requirements for Type II, No. 1, milk, as the bacterial count prior to pasteurization exceeds that permitted in the specification. It should not be accepted as Type II, No. 1, milk.

Those responsible for determining that the milk accepted at Army installations meets specification requirements should not fail to consider the quality of the milk prior to pasteurization.

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### MEDICAL SERVICE IN THE ITALIAN CAMPAIGN

Colonel Henry P. Carter, M. C., instructor in the Command and General Staff School, Fort Leavenworth, has compiled notes from actual field orders and administrative orders for supply and evacuation brought back from Italy by officers of the Command and General Staff School who were observers of the tactical operations carried out during the Italian peninsula campaign. These notes were further supplemented by reports from other observers and from staff officers of larger tactical units. It is said<sup>1</sup> that Italian aid stations were located some 300 to 500 yards from the forward area of contact and were evacuated frequently at night, much of the evacuation being done by hand-carried litters which is very arduous work down steep, boulder-strewn slopes. One of the medical detachments of an infantry regiment had five men killed in action and twenty-eight wounded. A six-man squad was found desirable for evacuation of casualties by hand-carried litters. A division surgeon reported that litter bearers must be young and in fine physical condition. Sometimes two or three squads are required for each litter case to be evacuated. Mountain evacuation has not yet been perfected. Twenty men from one company were required to bring two wounded men six miles. In one instance "an infantry regiment required 250 litter bearers one night to make an eight-mile turn-around trip, only to find out that there were no casualties." The additional

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1. Abstracted from *Military Review*, May 1944, pages 18 to 21.

litter bearers were obtained from engineers, artillery, and an infantry antitank company. A division surgeon said, that on account of narrow trails, "We may have to work out some kind of litter which permits its attachment, by a kind of buckle on the litter ends, to shoulders of the carriers."

Collecting stations were located from one to four miles back, depending on the terrain. Here were given blood plasma, morphine, and sulfanilamide, splints were examined, hemorrhage controlled, and shock treatment instituted. The first thing a wounded American soldier asks is "When do we eat?" These stations, therefore, should be well supplied with articles of food. A collecting company, not actively employed, set up a rest camp with hot shower baths as well as food. A casualty is transported from the advanced jeep ambulance loading point to a regular ambulance loading point farther back where cross-country ambulances can operate over fairly good roads, and thence to the collecting station or directly to the clearing station. Improvised jeep ambulances had to be used over the more forward trails and roads.

Clearing stations should be close to collecting stations—six to eight miles. After the battle is joined, they may be placed out in the open and well marked with large white crosses on red backgrounds. As clearing stations will not move often, selected cases may be held there from one to several days, if evacuation is not indicated. Exhaustion cases were treated here. After four or five days they would be able to resume some light duty in the division area, such as kitchen police, then as truck drivers or litter bearers, until fully recovered. This was regarded as a form of occupational therapy and not only restored 80 to 90 percent of these cases but helped morale. Several clearing companies frequently had auxiliary surgical teams. One clearing station was located close to artillery positions. A German aviator dropped a message telling the station to move; after this was done, the site was bombed and shelled by the enemy. Since our metal field chests have been found rather heavy for mountain transportation, packs are coming into use.

An observer stated that field hospitals with five surgical teams operated near the clearing station for immediate surgery, each team having one officer and two nurses. One field hospital was employed by platoons locating near clearing stations to take over those cases which required definitive treatment, thus permitting the division clearing station to accompany its division. While this is not a contemplated use of a hospital with fixed beds, it seems to have worked well in Italy. According to this report, many of the auxiliary surgical teams were too technical and needed training for work under field conditions. They have a tendency, it is said, to attempt too much surgery too far forward. While they have been used at clearing stations, they are of more importance there for diagnosis. A few are really good.

Evacuation hospitals can be set up in three to five hours. By borrowing additional transportation from the army or corps, they can leapfrog in echelon in support of a division. They were set up at times adjacent to the division clearing station "and took the serious cases direct." This unit is well liked. It is difficult to find suitable sites well forward for evacuation hospitals in Italy. The army surgeon's office likes this unit established about fifteen miles from the front.

Laundry is a big problem. They were able to get many civilians to do laundry and to serve as KP's and latrine orderlies, as there was a finance officer with the unit. Laundry and bathing units are regarded as highly important. Local water is usually muddy in winter. Shoes may last only ten to fifteen days in this mountain warfare. Arctics and heavy socks would be useful as the men's feet are continually wet and cold. One observers reported that the exchange of clean, dry socks for old, worn socks of front-line troops did much to save men's feet.

A wounded sergeant said, "Tell those Joes in the States that the medics and the chaplains will be their best friends when things get tough. They have been right with us since we hit the line."



Men of portable hospital unit in training in Australia, leaving water after swimming with full field packs.

## MUMPS

The Commission on Measles and Mumps of the Board for the Investigation and Control of Influenza and Other Epidemic Diseases reports, for the period 1 July 1943 to 20 April 1944, that moderate epidemics of mumps continued to occur among our troops from rural areas of the South and that the incidence of orchitis in such epidemics approximated 30 percent. The development of complement-fixing antibodies following experimental mumps in monkeys has provided a reliable tool for the experimental analysis of mumps. A fairly large number of persons were studied by means of the complement-fixation test during the acute and convalescent stage of the disease and without exception, the formation *de novo* of such antibody or its increase in concentration during convalescence was found. It would seem, this report states, that when this factor is present in normal human beings, in all probability it was originally induced by infection with the virus of mumps whether the disease was apparent or inapparent. Experimental mumps has been induced in human beings by means of monkey-passaged virus introduced into Stensen's duct. The serologic status of these persons was determined before and after inoculation and it was found that antibody appeared regularly during the early convalescence. Studies of two outbreaks of mumps in institutions in Philadelphia by means of complement-fixation tests strongly suggest that the disease occurred almost exclusively in persons negative to the complement-fixation test and that inapparent infection occurred in a large proportion of negative reactors who did not develop clinical mumps as indicated by the development of antibody during the period of the epidemic.

The Commission spent much time and effort in trying to propagate the virus of mumps but the results of its experiments were entirely negative. It is evident that the virus is strictly adapted to certain hosts and to a certain sort of tissue in those hosts. This conclusion is further substantiated by the failure to demonstrate virus in the testes of mature monkeys following inoculation of those organs or in the brains after intracerebral inoculation, although in the same animals inoculated into the parotid duct, large quantities of virus were found.

An interesting finding in the course of an epidemic of mumps at a station in the South was a soft, pitting edema centering over the sternum and extending from the suprasternal to the xiphoid process, sharply demarcated and prominent. The overlying skin was normal in color, suggesting a lymphatic obstruction. This finding occurred in six patients and, in view of its rarity, these cases, it is stated, will be reported in detail.



### A REMOVABLE PLASTER OF PARIS BACK SUPPORT

The appliance to be described was observed by Major W. E. Looby, M.C., at the 297th General Hospital where it was successfully used on patients convalescing from attacks of low back pain. As the Army makes no provisions in forward echelons for temporary supports for the treatment of cases of lumbosacral, sacro-iliac, and other types of low back dysfunction, this type of dressing may prove to be helpful in those units. It is readily available, removable, and inexpensive and is intended primarily for patients who have sufficiently recovered to be up and about, yet need some immobilization and support.

Plaster of paris is thought of as a rigid, unyielding substance which remains in situ until no longer useful. That need not be the case. By simply incorporating strips of used x-ray film into a thin plaster shell, sufficient flexibility can be obtained to facilitate easy removal and reapplication of the splint by the patient and yet furnish adequate support and immobilization of his back. The brace can be made in any width up to that which will immobilize the entire torso.

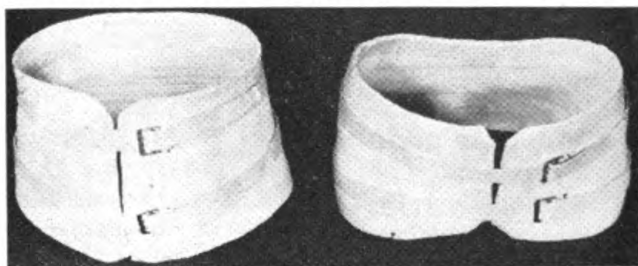


FIGURE 1. Removable plaster back brace. The one on the left is intended for support of the lumbosacral joint. The one on the right is to be used where support in the sacro-iliac area is indicated.

The materials necessary for the application of this support are: 8-inch stockinet long enough to cover the patient where the cast is to be applied; five to eight rolls of 6-inch plaster of paris dressings; twelve strips of used x-ray films, 2 inches wide by 12 inches long; adhesive tape; two or more web straps with buckles; a strip of felt, 2 inches wide and 16 inches long.

#### Technique of Application

The patient is first fitted with a suitable section of stockinet 8 inches wide. A narrow piece of felt or several layers of sheet wadding are placed vertically along the anterior midline to facilitate splitting the cast after its application. The patient is then placed in the desired position and several turns of plaster applied. The strips of x-ray film are placed at varied angles and incorporated into the plaster as it is being applied in order to give the finished support sufficient flexibility to enable it to be removed and applied at will. The remainder of the plaster is then applied in the usual manner, keeping in mind that the thinner the plaster shell the less likelihood there is of its breaking subsequently. For the ordinary low back brace, five rolls of plaster should be sufficient. This will result in the splint being about  $\frac{1}{4}$  inch thick. After allowing twenty minutes for setting, the parts to be trimmed away are

outlined and the support is split anteriorly over the felt or sheet wadding which had been previously placed there to facilitate this procedure. The cast is then removed, and the superfluous parts are cut away with a sharp knife. The shell is allowed to dry for twenty-four hours. The edges are then bound and the web straps secured with adhesive tape as shown in the photograph. Should it later be necessary to reduce the size of the support to maintain a snug fit, this can be done by trimming the desired amount from either side of the anterior junction and rebinding it with adhesive tape.

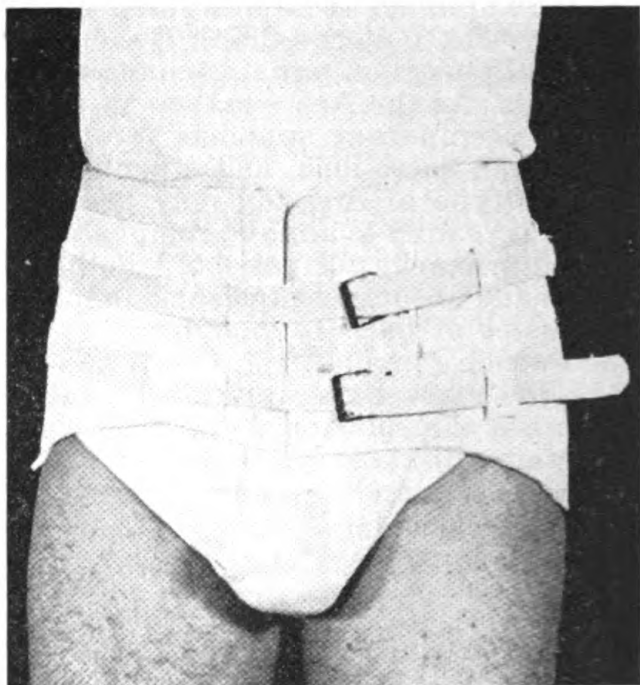


FIGURE 2. Patient wearing the sacro-iliac support illustrated in figure 1.

#### INTRAOCULAR CORDITE

Cordite is a smokeless powder composed of nitroglycerin, guncotton, and mineral jelly. Very few reports as to cordite alone as an intraocular foreign body have been made. Goulden and Whiting write that particles of cordite may remain in the eye indefinitely without causing trouble and, unless visible in the interior chamber and easily reached, are best left alone in view of the danger involved in their removal.<sup>1</sup> This statement confirms the experience of Lieut. Colonel Arthur C. Unsworth, M.C., at an Army Air Forces regional station hospital in Florida, who reports two cases in which cordite was introduced into the eye when a machine gun jammed and the cartridge backfired, causing perforation of the cornea and injuries to the lens and iris, limiting vision to light perception in one case and to hand-movement at 1 ft. in the other. X-ray examination showed no foreign bodies anywhere in the injured eyes or in the head. Prophylactic doses of tetanus, *B. welchii*, and *Vibrio septique* were given and the eyes were treated conservatively. From the satisfactory visual results of these two cases, it seems that intracocular cordite in itself is relatively innocuous and similar cases should be treated conservatively.

1. Goulden, Charles, and Whiting, M. H.: Perforating Wounds of the Eye-ball, p. 855, in *Surgery of Modern Warfare*, by Hamilton Bailey, 2d ed., vol. 2. Baltimore: Williams and Wilkins Co., 1942.



## CONFERENCE ON INDUSTRIAL MEDICINE AND HYGIENE

Industrial medical officers and industrial hygiene engineers representing the service commands, ports of embarkation, arsenals, and other Army installations attended a conference at the Army Industrial Hygiene Laboratory at Johns Hopkins University, Baltimore, 25-26 May. Brief addresses were made by Major General Norman T. Kirk, Surgeon General; Brigadier General James S. Simmons, chief of the Preventive Medicine Service, Surgeon General's Office; Colonel William A. Hardenbergh, director, Sanitary Engineering Division, Surgeon General's Office; and Lieut. Colonel William J. McConnell, Office of the Chief of Ordnance. Colonel A. J. Lanza, director, Occupational Health Division, Surgeon General's Office, who presided the first day, introduced the following recently appointed consultants in industrial medicine: Doctors Robert A. Kehoe, Cincinnati; George M. Smith, New Haven; and W. P. Yant, Pittsburgh. The group inspected the Laboratory, the primary function of which is service to all Army industrial installations. Some of the services performed by the Laboratory were discussed in *The Bulletin*, January 1944, page 3. The service functions, in general, consist of epidemiologic surveys in Army industrial installations to determine those factors which affect the health of industrial workers. Lieut. Colonel Raymond Hussey, director of the Laboratory, pointed out that the essential difference between the epidemiologic surveys conducted by this Laboratory and those developed for infectious diseases is that the former depend on the principles and methods of chemistry, pharmacology, and toxicology, and the latter on the principles and methods of microbiology, immunology, and serology. The problems of industrial medicine and hygiene in their administration and technical aspects require a group of individuals willing to pool their knowledge and experience in engineering, medicine, chemistry, pharmacology, toxicology, and statistics in order to work as a team with the successful integration of their efforts as the goal. This concept represents the basis for the organization of the Army Industrial Hygiene Laboratory.

On the second day, Dr. Abel Wolman, professor of sanitary engineering, Johns Hopkins University, gave an address on "The Future Educational Organization to Include Correlation of Preventive Engineering and Medicine." Dr. Wolman said that much thought was being given to this subject and that a number of conferences had already been held. This field no doubt will be included in postwar educational programs. Obviously the educational requirements for industrial medicine and industrial hygiene cannot be met by short intensive courses of instruction in classrooms, but will require the correlation and coordination of classroom teaching with extensive field experience. Among other subjects discussed were "Lead Hazards in Firing Ranges,"



**FAILURE OF SWEAT MECHANISM IN THE DESERT**

An effect of extreme heat on the body which must be differentiated from heat stroke and heat exhaustion is reported<sup>1</sup> by Captains Julius Wolkin, Joseph I. Goodman, and William E. Kelley, Medical Corps, Army of the United States.

"The syndrome of failure of the sweat mechanism in the desert which we have described, stands out clearly from the hitherto accepted concepts which identify only heat stroke, heat exhaustion and heat cramps. The early recognition of the syndrome is of paramount importance, since its proper management demands immediate removal from excessive heat. Often there has been a tendency to regard this group as merely forms of heat exhaustion and to return these soldiers to duty with only the admonition to continue oral salt intake. Salt is not indicated and we believe of no value.

"We can not stress too much that these patients require avoidance of exposure to excessive heat until the sweat function has returned to normal. Even after recovery we are inclined to oppose their return to similar climatic conditions."

The report is based on a study of eight soldiers engaged in normal military training in the American desert area. In general these cases all had a rather sudden onset of generalized weakness, subjective warmth and discomfort, dizziness, "all-in" feeling, headache, and shakiness. These symptoms occurred during exposure to sunlight, either with or without physical exertion. The onset was associated with or preceded by a cessation of sweating in each case. This was, in turn, often preceded by a distinct period of profuse outpouring of sweat from a few days up to several weeks in duration. The loss of sweating was limited to the body below the neck in pronounced contrast to the outpouring of sweat from the face and neck.

The objective findings were characterized by a warm, dry skin from the neck down, whereas the face and neck showed profuse droplets of sweat. The skin of the entire body below the level of the neck had the appearance of goose flesh except that this eruption did not appear and disappear in a matter of minutes like goose flesh.

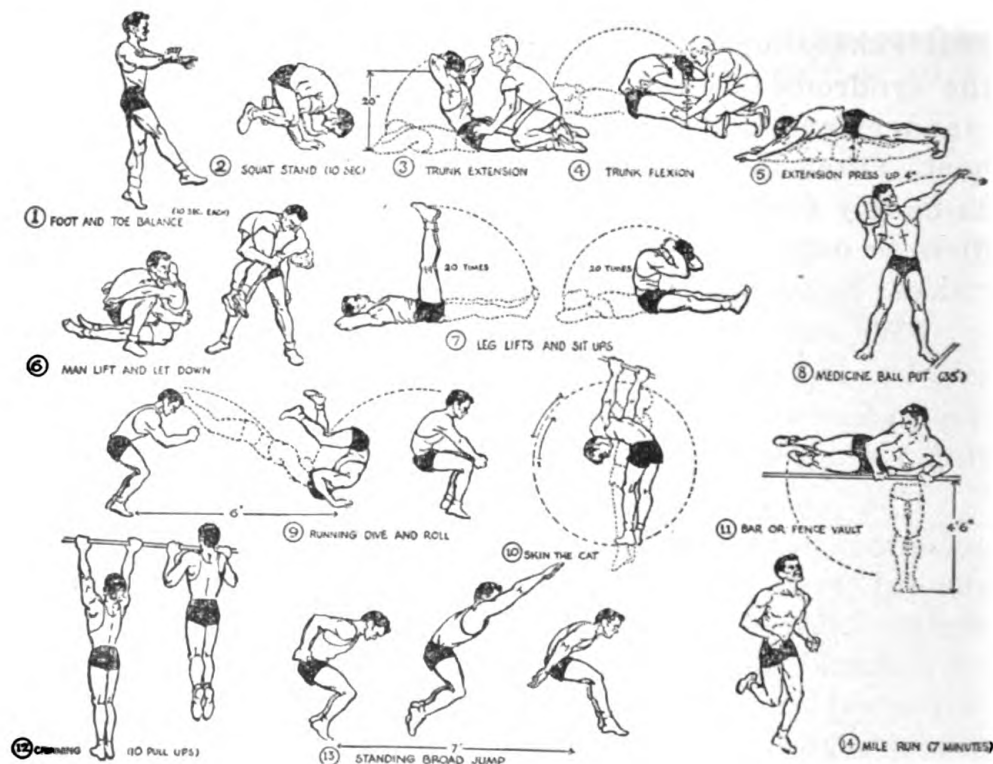
In general, all of these cases promptly improved subjectively by the simple expedients of cool environment and rest.

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1. J. A. M. A., 19 Feb. 1944, p. 478.

## THE MOTOR UNFITNESS OF YOUNG COLLEGE MEN

The proportions of motor unfitness among young men are appalling, Thomas K. Cureton, Ph.D., of the School of Physical Education of the University of Illinois, Urbana, declares in reporting a study of young men at the University. By motor fitness is meant the capacity to run, jump, dodge, fall, climb, swim, ride, lift and carry loads, and endure long hours of continuous work.



Dr. Cureton says:

Physical training programs are not compensating rapidly enough for urbanization with its associated mechanization, indoor work, dependence on motor vehicles and lack of the necessity of hard physical work in youth.

Large numbers of young men are entering adult life unconditioned and unmotivated to maintain physical fitness. This trend may contribute greatly to high accident rates, rapid loss of health after the age of 30 and widespread chronic disease because of the lack of preventive hygiene and conditioning work for the body.

Physical education and recreational programs have been inadequate, possibly because of inadequate time, facilities and leadership. In addition, the programs too infrequently focus on the physical fitness objective in terms of big muscle and organic endurance criteria. The socialization of the programs has possibly hurt the conditioning value of the activities.

Abstract of an article published in The Journal of the American Medical Association, 11 September 1943.

Many activities, such as bowling, dancing, socialized games, archery, bait and fly casting, badminton and tennis, possibly contribute very little as they are taught in typical physical education or recreation classes.

Basic motor fitness training would include deliberate emphasis on ability in a wide range of activities for balance, flexibility, agility, strength, power and endurance, apart from health knowledge, rules of the game, social play relations or form in refined physical skills.

The fact that 60 percent of those failing to pass the motor fitness test cannot swim 100 yards, and 85 percent of these cannot swim 440 yards, is a deplorable fact which indicates lack of organization in the schools to teach the important skills of swimming. Thousands of drownings in the war are directly attributable to this omission. . . .

The medical and public health reports of the Metropolitan Life Insurance Company and the Medical Division of Selective Service do not indicate the extent of unfitness of young men in motor fitness but deal with the more general health aspects involving teeth, eyes, heart, ears, feet, lungs, hernia, musculoskeletal defects, and venereal diseases. . . .

Physical ability involving balance, flexibility, agility, strength, power and endurance in a variety of performances sums up to motor fitness. A bad gap or blind area of development in any of these aspects will result in physical inefficiency in a large number of related performances. Motor fitness emphasizes the more generalized gross and fundamental physical abilities which are dominated by development of the kinesthetic sense, muscular energy and suppleness of the tissues and joints, including the aspects which are basically involved in athletic or work skills with the big muscles of the body rather than the finer or low energy precision skills.

Balance represents neuromuscular control paralleling the development of the kinesthetic sense in acts of sitting, skating, riding, tumbling, walking logs or fences, skiing, dancing, and a host of everyday skills. . . .

Flexibility emphasizes the ability to move easily in the full range of joint movements, to tuck up tightly, to bend easily at the waist, to twist the spine easily, to point the toes fully, and to breathe deeply and fully without much extra effort.

Agility emphasizes the capacity for fast reaction in controlled nimble movements, "rabbit-like" in action, and to move quickly, dexterously, and easily. . . . Strength emphasizes the capacity of the hands, legs, or trunk to exert great force . . . Power emphasizes the capacity to release great explosive force to sudden violent efforts. . . . Endurance is capacity for continuous exertion, involving in the first minute or two severe depletion of the oxygen reserve and the development of oxygen debt with severe distress. . . .

Analyzing the motor fitness of 2,628 young men entering the University of Illinois in September 1942, Dr. Cureton says that they were fresh from high schools of Illinois and nearby states. The results were startling because among the 35.84 percent who failed to pass the test the proportion of failures in

fourteen basic tests were so high "that concern should be manifested for the physical and health future of the men. For instance, 79 percent could not lift the legs from the floor twenty times while lying on the back and then do twenty sit ups in succession. This standard is not very high, because a fit man can do as many as one hundred leg lifts and two hundred to five hundred sit ups. Some 78.8 percent could not chin themselves ten times in succession and 76.1 percent could not jog a mile in seven minutes, a very mediocre performance for any one who has the ability to run the distance. . . ."

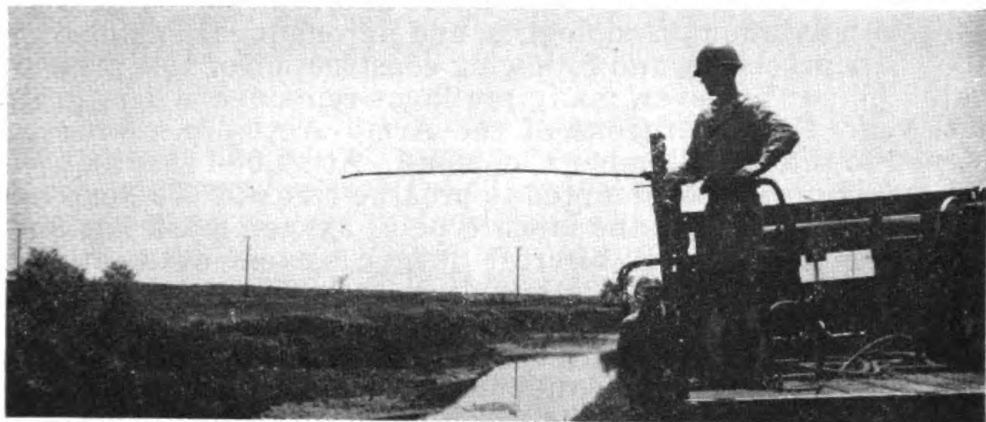
The findings in swimming ability were also significant. Of 2,557 who responded to a swimming questionnaire, 679 men, or 26.55 percent, said they could not swim at all, 40.13 percent said they could swim 75 feet but not as much as 100 yards and only 12.40 percent stated that they were life savers.

#### ABDUCENS PALSY FOLLOWING LUMBAR PUNCTURE

A case of abducens palsy following lumbar puncture, a rare complication, has been reported by Major Harry M. Robinson, Jr., M.C. A soldier, aged 26, had completed the required course of treatment for early syphilis. A spinal puncture was performed to complete his survey prior to probation. Two days later he was admitted to hospital with pain in the back and legs, headache, and faintness, followed in three more days by double vision. Examination revealed partial paralysis of the right abducens nerve with almost complete strabismus of the right eye. In two more days paralysis of the right sixth cranial nerve was complete. The diplopia was so severe he had to wear a patch over the eye. A complete neurologic examination was entirely negative otherwise. About twenty-three days later gradual improvement began and continued until restoration of sight to normal. He was discharged to full duty about three months after admission to hospital. The patient's blood studies were normal, the blood and spinal fluid Kahn tests were negative as were the urinalysis and the x-ray examinations of the chest, skull, and long bones and spine. The author quotes J. E. Moore as stating in his book, "The Modern Treatment of Syphilis," published by Thomas in 1943, that one of the serious sequelae of lumbar puncture is a basilar subarachnoid hemorrhage which follows the operation by several hours. Because of the superficial course of the nerves supplying the muscles of the eye, extraocular palsy results.

### IMPROVISED POWER OILING EQUIPMENT

The Chief of the Sanitary Branch, Station Hospital, Camp Beale, California, reports the assembly, from materials at hand, of a device which will discharge a stream of oil as far as 25 feet. A one horsepower gasoline engine was connected by a drive shaft to a centrifugal pump from which a 1-inch rubber suction hose leads to a 50-gallon drum of oil. The discharge line of  $\frac{3}{4}$ -inch hose about 40 feet long is connected to



the pump and into the end of this hose is inserted a  $\frac{1}{4}$ -inch metal pipe, 6 feet long, ending in a knapsack oiler nozzle. The entire assembly, including possibly several 50-gallon drums of oil, is placed on a truck which is driven slowly along the body of water to be oiled while one man directs over the water the stream of oil from the oiler nozzle. In case the truck cannot approach closely to the body of water, the man handling the discharge pipe walks along the edge of the water as the truck moves along. This accounts for the rather long length of discharge hose and pipe.

The machinery for this improvisation was provided by the post engineer plumbing shop, the pump and motor having previously been assembled for other uses.

### MONTHLY MEETINGS AT ARMY MEDICAL CENTER

At the meeting of medical officers, Army Medical Center, Washington, D. C., 19 June, Brigadier General Frederick A. Blesse, Surgeon, Army Ground Forces, spoke on medical service in the North African Theater. General Blesse was Chief Surgeon during the North African Campaign. Colonel Robert B. Skinner, M.C., spoke on medical service in the Pacific areas, from which he recently returned.

At the meeting 15 May, Captain Andrew G. Prandoni discussed the "Diagnosis and Treatment of Peripheral Vascular Disorders"; Lieut. Colonel Harrison J. Shull, "Penicillin in Internal Medicine"; Lieut. Colonel Roy H. Turner, "Infectious Hepatitis"; Lieut. Colonel Francis R. Dieuaide, "Clinical Aspects of the Malaria Problem."



## MEDICAL PROBLEMS OF THE B-29

The crews in B-29 superfortresses, when aloft, live in air-conditioned, heated, and soundproofed cabins and in near-normal air pressure, the War Department has announced. Free from wearing oxygen masks and from sub-zero cold, the air-men complete a mission with a minimum of fatigue. Pressurized cabin planes, first produced in 1937, went into commercial transport operation as Stratoliners in 1939. The basic problems of breathing in the stratosphere had been solved by flight surgeons, aviation physiologists, and aeronautical engineers in the years preceding and following construction of this pressure cabin plane; however, many problems remained when, in the last year, flight surgeons of the Army Air Forces were assigned to the 20th Bomber Command. At 40,000 feet an aviator would die if he attempted to breathe free air. To keep him functioning normally the latest type of oxygen mask has been provided. The A.A.F. aircraft oxygen system automatically increases the oxygen breathed from the 20 percent found in free air all the way up to 100 percent at altitudes over 30,000 feet. Above 40,000 feet the air pressure is so low that even 100 percent oxygen is inadequate for the flyer and the only way to extend his service ceiling is to increase the air pressure at that altitude. This has been done in the B-29 in the same way that airplane engines are supercharged in order to get enough oxygen into their carburetors; that is, by compressing the air.

Likewise the flyer's lungs in the B-29 are "supercharged" by a machine which maintains the air pressure in the sealed cabin while the pressure outside progressively decreases as the plane ascends. At a predetermined altitude, the cabin supercharger takes hold and maintains the corresponding inside air pressure until the airplane reaches a relatively high altitude. With the new type of air-conditioning, the crew does not have to use oxygen masks at altitudes which require oxygen in other types of bombers.

After engineering requirements for the B-29 had been established, this question remained: What would happen if a cannon shell went through the cabin and caused a rapid release of air pressure, somewhat like a pinprick in a toy balloon? To solve this problem the Aero Medical Laboratory made numerous tests on experimental animals and human subjects. An officer was placed in a sealed cabin and the cabin was placed in a low-pressure chamber in the laboratory. The pressure in the chamber was lowered to that of a high altitude while the pressure altitude in the cabin was held at a moderate figure. A screw driver was then plunged into the sealed cabin. As air rushed out, it was as if the officer had been catapulted in an instant five miles up through the atmosphere. His cheeks and lips bulged and his chest contracted as air was sucked from his lungs. Being in very thin air, he put on an oxygen mask and then was all right. This officer repeated the experi-



ment many times and suffered no ill effects. Eventually all flight surgeons in the 20th Bomber Command underwent "explosive decompression" at Wright Field.

Each crew member has a double supply of oxygen so that if one system is shot out, another is available. Heat to protect them against sub-zero temperatures of the stratosphere is provided by the cabin supercharger, and a new type of electrically heated flying suit which the individual can wear as an ordinary suit when the cabin heat is sufficient or he can plug it in when he feels cold. In addition, each man is provided with an insulated type of flying suit known as the intermediate alpaca.

Flight surgeons in the 20th Bomber Command instruct all air crews in the use of oxygen masks, clothing, first-aid and other emergency equipment. This includes arctic, jungle, air-sea rescue, aeronautic first-aid, battle splint, and blood plasma kits with which each airplane is equipped. They also teach fliers how to survive when forced down in the Arctic, jungle, desert, or sea. The care of the wounded in flight is a special problem as the B-29's long range may mean that a flier is wounded six or eight hours' flying time from his base. Emphasis is placed on instruction in advanced first-aid measures. Two members in each crew receive the special course of training given technicians in the Medical Department. A rigging made of parachute harness straps has been devised to carry the wounded on litters in the bomb bay. One ship can thus evacuate sixteen patients. Two bunks are available for wounded crew members.

Instruction is given in the free-fall technique of parachute jumping because of the danger of asphyxiation if the parachute opens at an altitude of more than 30,000 feet. A bail-out bottle supplying oxygen is a standard fixture on the parachute harness. The bottle is attached permanently to the oxygen mask. The flier needs only to turn a valve to get enough oxygen to carry him down to a safe level.

B-29's have two food warmers, which contain trays, each holding sufficient food for one full meal and a snack. Food and drink are prepared prior to flight and kept cold until two hours before use when the warmer is turned on.

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#### MEETING OF MILITARY SURGEONS

The Association of Military Surgeons of the United States will hold its annual meeting at the Pennsylvania Hotel, New York City, 2 to 4 November. There will be formal papers, panel discussions, and scientific and technical exhibits, in addition to addresses by the Surgeons General and other distinguished guests. The chairman of the convention and program committees is Colonel C. M. Walson, M. C., Headquarters, Second Service Command, Governors Island, New York.

### THE ADJUSTMENT OF TUBERCULOUS PATIENTS

A crucial period for the tuberculous patient is the several weeks before he leaves the Army hospital to be admitted to a veterans' hospital. This period should be utilized for the proper education of the patient, to impress him with the seriousness of his disease so that he will take full advantage of the care which the veterans' hospital offers. Captain H. E. Bass, M.C., suggests that, to provide tuberculous patients with suitable knowledge for this adjustment and understanding, advantage be taken of sound films which the National Tuberculosis Association and various state tuberculosis associations have made available. These sound films are mostly 16 mm. and in the form of animated cartoons and movie shorts. Several of them can be shown in a tuberculosis ward in an afternoon. They provide entertainment and serve to prepare patients for the long period of hospitalization ahead of them. Following the use of such films as "They Do Come Back," "Middletown Goes to War," and "Let My People Live," patients have been found to maintain more readily their bed rest and to be more psychologically adjusted for entering a veterans' hospital. They become, at the same time, aware that their disease is communicable and that their failure to accept the complete necessary hospitalization may result in spreading the disease to other persons.

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### PAYMENT OF CIVILIAN DENTAL LABORATORY FEES

The Dental Division of The Surgeon General's Office has again been informed that some dental officers are sending impressions or stone casts to civilian laboratories for the fabrication of dentures and the construction of bridges, as well as porcelain jacket crowns, for military personnel, dependents, or others, the laboratory fees being paid by the recipient of the service.

Attention is invited to existing directives—letter, A.G.O., 703 (4-16-42) M O-S P-M, 25 April 1942, with reference to dental attendance for dependents, and S.G.O. letters directed to the commanding generals of the respective service commands, dated 26 and 27 November 1942, with respect to the taking of impressions for dentures and having such cases processed in civilian dental laboratories. These letters were republished in the *Army Dental Bulletin*, January 1943, pages 31 and 32.

AR 40-510, C-1, paragraph 5b, 10 September 1942, clearly defines the extent to which the civilian dental laboratory will be utilized and the channels through which authority is granted for such use. Reference is also made to S.G.O. Circular Letter No. 163, 14 September 1943.

### THE RECONDITIONING OF PATIENTS .

Medical officers should consider the difference between a program of maintenance and a program of improvement. First, when a patient goes to the hospital, especially when he is immobilized for some time, he tends to retrogress rather rapidly. A patient in excellent condition retrogresses even more rapidly. It has been found by experimentation in the physiological laboratory that an individual capable of enduring 18,000 kilogram-meters of work in a given time without rest, after two weeks' inactivity in which time he is walking around but doing no other exercise, will retrogress until he has the ability to do only 8,000 kilogram-meters of work in that time. Hence, it is important not to let up on the program.

Muscular endurance is an important element. This is the ability to carry a moderate load over a long period of time. This may be thought of also as the development of stamina. In submaximal exercise of muscle groups carried over a considerable period of time, there is a hyperplasia of new capillaries into the muscular tissue. It has been found by physiological research, notably the work of Krogh, that the actual number of functioning capillaries may increase as much as 400 percent in active working muscle tissues. In six or eight weeks of inactivity, those become nonfunctioning again. Hence, it is important that exercise be continued in hospital as a maintenance measure.

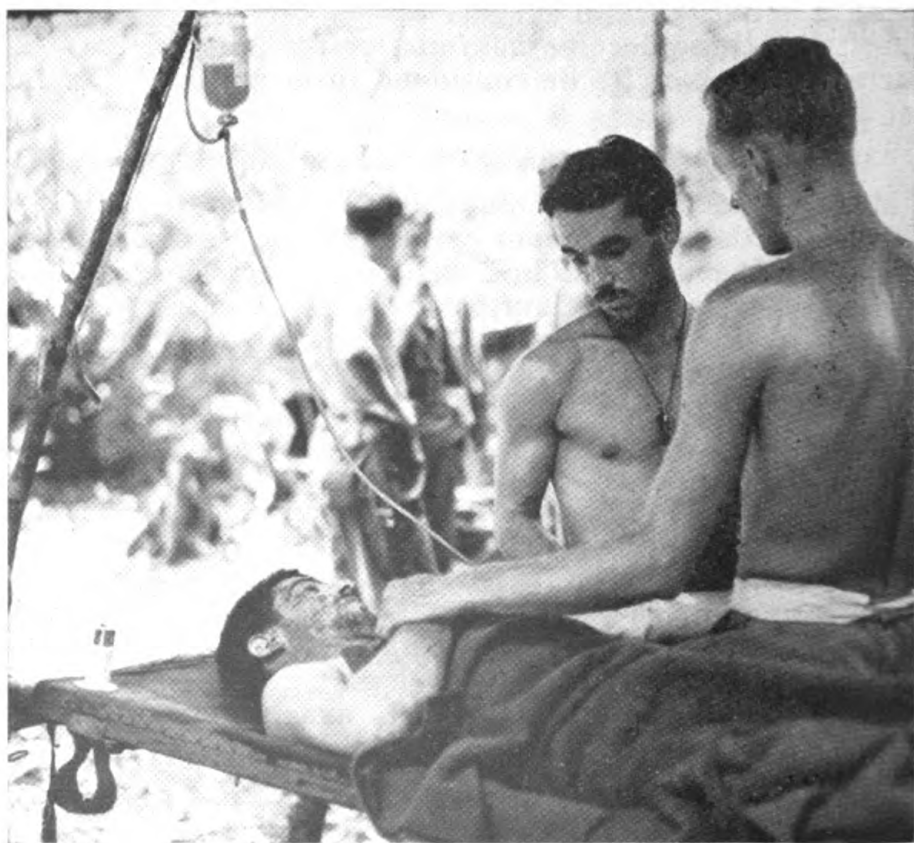
#### Reconditioning of Medical Patients

Many officers in the medical services of the hospitals have been loath to experiment with exercise in the reconditioning of medical patients. The facts have not been as clear-cut as they are in the case of surgery. There has been in civilian practice almost no precedent. There has, however, been considerable experimentation in the Air Forces hospitals on medical diseases. A well-conducted and long-continued experiment at Jefferson Barracks, in St. Louis, by Lieut. Colonel Rusk and Captain Ericksen, on cases of atypical pneumonia has provided clear-cut evidence of the value of exercise programs in the reconditioning of these patients. There were two series of these patients distributed in alternate groups. One group was permitted to stay around the hospital with very little attempt at reconditioning, just as has usually been the practice in civilian life. The other group, which may be called the experimental group, was started on gentle exercise after the sedimentation rate had reached 10 mm. in thirty minutes. The exercise was then very rapidly increased in severity from day

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Extracts from address by Dr. C. H. McCloy, research professor of physical education, University of Iowa, and consultant in physical reconditioning, Surgeon General's Office, delivered at a conference on reconditioning at the Schick General Hospital, 22 March 1944.

to day. The nonexercise group remained in the hospital an average of forty-five days and after going back to duty exhibited a 30 percent relapse. The experimental group which went through the reconditioning program spent an average of thirty days in the hospital with a relapse rate of only 3 percent. In other words, they saved fifteen days' hospitalization and had 27 percent less incidence of relapse. While the medical officer should be commendably cautious in protecting the interests of the individual patient, there is every likelihood that cautious experimentation on all types of medical cases would show that within a reasonable time after the patient seems to be clinically out of danger, as exhibited perhaps by the return of the sedimentation rate to normal, buttressed by the observation of the ward officer, the patient can be put into the reconditioning program as a class 3 patient with nothing but benefit to him. Due care must be exercised, of course, to see that individual differences in condition, either due to the severity of the illness or to the initial physical condition of the man, are allowed for and taken fully into account in the prescription of exercise for each man.



Administering blood plasma to wounded soldier at portable hospital in New Guinea. Signal Corps photograph.

## HOSPITAL SHIPS

On 1 July a fleet of eighteen hospital ships with a capacity of more than 10,000 patients was in operation for the Army. Ten new hospital ships, converted from Army transports and cargo vessels, were placed in service in June. These ships are sailing to foreign theaters to evacuate sick and wounded troops. The ports from which the ten new ships sail are: the *John L. Clem* from New Orleans; the *Ernest Hinds* from San Francisco; the *Marigold* from Seattle; the *Larkspur* from Jacksonville; the *John J. Meany* from Boston; the *Dogwood*, the *Blanche F. Sigman*, the *Emily H. M. Weder*, and the *Wisteria* from New York; and the *Mercy* from Los Angeles. The *Mercy* is a Navy ship manned by the Navy and operated for the Army.

The hospital ship program was described in *The Bulletin*, February 1944, page 35. The present fleet includes the *Acadia*, the *Algonquin*, the *Chateau Thierry*, the *St. Mihiel*, the *Seminole*, the *Shamrock*, and the *Thistle*. The *Comfort*, owned and manned by the Navy, is operated for the Army. Six more hospital ships will be added to this fleet by the end of the year: the *St. Olaf*, the *Jarrett M. Huddleston*, the *Charles A. Stafford*, the *Lewis Luckenbach*, the *Dorothy Luckenbach*, and the *Hope*, which like the *Comfort* and the *Mercy* will be operated by the Navy for the Army.

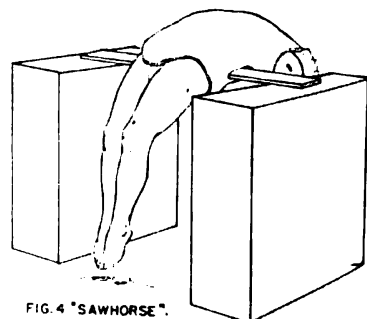
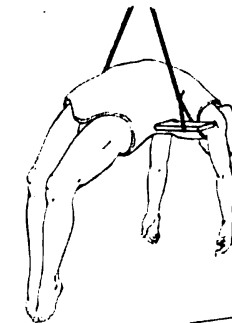
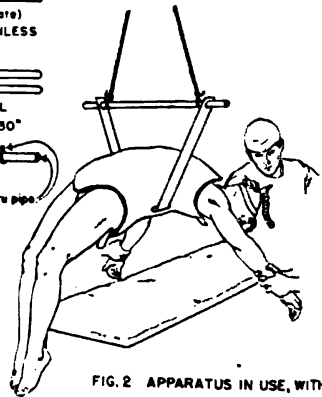
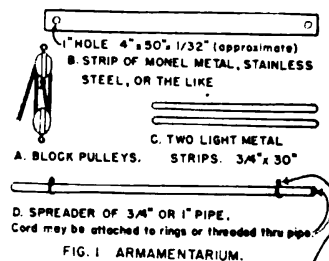
This mercy fleet which is operated in accordance with the Hague Convention of 1907, will have a total patient capacity of more than 14,000. Some of these ships may be used in intra-theater operation, for example for the evacuation of wounded from France to hospitals in England. The more seriously injured would be transported later to the United States. The Medical Department staffs the vessels, including the three Navy-operated ships, with Army medical personnel.

The hospital ship is white, with a horizontal green band the whole length of the ship on each side, a huge Red Cross in the middle of the starboard and port sides, another on deck and others on each side of the funnel. The vessel is equipped to provide electrical illumination, including lighted Red Crosses, from sunset to sunrise; unarmed, it carries only the crew, medical personnel, and patients. Further evidence of its identification and mission is provided for each ship in a Certificate of Commission signed by the Secretary of War and the Secretary of State. As set forth in the Hague Convention, hospital ships are designated as such for the Secretary of State on the request of the Secretary of War, and the belligerent governments are notified. Enemy nations also are advised of the designations of each of our hospital ships. Life boats and life rafts of United States Army hospital ships are painted white and have been marked with large red crosses and horizontal green bands, similar to vessel markings.

## TREATMENT OF COMPRESSION FRACTURES OF THE SPINE

A method calculated to make the hyperextension procedure easier in the treatment of compression fractures of the vertebrae was outlined in the *Journal of Bone and Joint Surgery*, October 1940, by Dr. (now Major) Edward Parnall. The apparatus (figure 1) consists of an ordinary block pulley with wheels about 2 in. in diameter suspended from an overhead hook; a thin strip of metal about 4 in. by 50 in. with a 1-in. hole at each end; a spreader made of 1-in. pipe; and two very light strips,  $\frac{3}{4}$  in. by 30 in., pliable enough not to prevent full hyperextension when placed lengthwise under each side of the spinal column. The apparatus is used (figure 2) with or without anesthesia. The patient is completely suspended from the metal sling so there is no contact with the table. After application of the cast, the metal strips can easily be slipped out, leaving a window on each side for x-ray views.

When this apparatus is not available, hyperextension reduction can be accomplished just as effectively by using a "boat-swain's (or bosun's) chair" with overhead pulley (figure 3), or the patient may simply be placed across a well-padded board, with the board at the level of the vertebra involved. Then an assistant lifts each end of the board, with a third man steadying the patient by his feet, onto a pair of sawhorses or boxes (figure 4). The patient is turned over after the cast hardens, the board is cut out,



and the cast patched. *Caution: Do not take a short cut by merely sawing off the ends of the board, as pressure necrosis will result.* The sawhorse method is convenient to use in the field, even with an x-ray machine unavailable; it is a safe way to transport all suspected vertebral fractures (figures 3, 4, 5, and 6).

The cast must reach in front from the sternal notch to the symphysis pubis. It is difficult to do this satisfactorily by merely winding the plaster. The patient will be unable to sit upright conveniently, but will be compelled to lean backward with the hips partly extended unless the cast is properly trimmed in the groin. An abdominal window and generous cut-outs at the axillae are also made (figure 7).

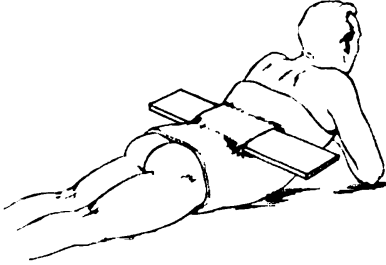


FIG. 5. CAST APPLIED, READY FOR REMOVAL OF BOARD.

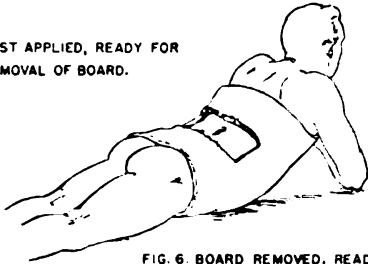


FIG. 6. BOARD REMOVED, READY FOR PLASTER PATCH

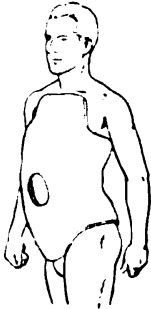


FIG. 7. CAST APPLIED. (NOTE GENEROUS CUT-OUTS AT AXILLAE AND GROINS, WITHOUT IMPAIRING EFFICACY OF CAST.)

In most of the cases thus treated Major Parnall has followed a routine of checking the reduction by x-ray on the following day, allowing the patient to be up after two days, and checking by x-ray after three more days to see if there is any recompression. If everything is as it should be, the patient may continue up and about. Abdominal distention and paralytic ileus appear to be avoided by early walking and activity. The most important item of aftertreatment is the careful instruction of the patient in erector spinal and abdominal exercises daily. When the patient comes out of the cast, usually at three months, he should have good muscles which will permit early functional recovery.

tient comes out of the cast, usually at three months, he should have good muscles which will permit early functional recovery.

#### ARMY MEDICAL MUSEUM SEMINARS

The following subjects have been discussed at seminars at the Army Medical Museum: "The Pathology of the Dysenteries," 19 February, by Colonel J. E. Ash, curator of the Museum; "Experimental Investigation of Adaptive Arterial Intimal Hyperplasia," 29 April, Dr. Alan Moritz, professor of legal medicine, Harvard University, and current resident in pathology, Army Medical Museum; "Experimental Studies of the Pathology of Periarteritis Nodosa and Rheumatic Carditis," 13 May, Dr. Arnold R. Rich, associate professor of pathology of Johns Hopkins University School of Medicine and current resident consultant in pathology; "Experimental Brucellosis," 27 May, Dr. Wiley D. Forbus, professor of pathology, Duke University, and current resident consultant in pathology.

### ARMY SCHOOL OF MALARIOLOGY

The Army School of Malariology at Fort Clayton, Panama Canal Zone, has been functioning since February 1943. Three courses of four weeks each have been completed and sixty-four officers of the Medical Department have received instruction. The course is designed to give training in the principles of military malaria control to medical and sanitary corps officers. Medical officers should have satisfactorily completed a course in tropical medicine before they are selected as students. Flexible quotas have been set up for the major components of the Army and for the various service commands. Each class will consist of about twenty-five to thirty officers. Selection will be made on the basis of previous experience and the usefulness of the training in the officer's present assignment. One class is now in session and four additional classes are scheduled for the remainder of 1944. Inquiries should be addressed through channels to the Office of The Surgeon General.

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### NURSES AWARDED SILVER STAR

Three U. S. Army nurses, Lieut. Mary L. Roberts, Dallas; Lieut. Elaine A. Roe, Whitewater, Wisconsin; and Lieut. Rita V. Rourke, Chicago, have been awarded the Silver Star for heroism during action on the Fifth Army's Anzio-Nettuno beachhead in Italy in February, during a concentrated shelling of a field hospital area at which time several nurses were killed and many military personnel wounded. (War Times, 28 April 1944)



The first group of U. S. Army nurses to land in North Africa shown in front of their home in Algiers. 31 December 1942. Signal Corps photograph.



### MICROFILMING RESEARCH MATERIAL

The microfilm work of the Army Medical Library, Washington, D. C., is set up to provide: (1) the sending of medical material to members of the armed forces in the war theaters; (2) the furnishing of medical research material to our allies to replace that destroyed by enemy action; (3) aid to those engaged in scientific research. The policy of the Library in microfilming this material is based on the assumption that current research material is of utmost value to medical men in the armed services. It is impossible in many areas to supply the original article, and microfilm, which can be sent easily by air mail, has been substituted.

This work falls into three categories: (1) The microfilming of single articles from journals or publications. These are made and distributed in this country and abroad as requested, to save the wear and tear of sending original material through the mails. Such microfilms show the name of the author and the publication in which the article appears. (2) The microfilming of complete medical journals. These are now sent regularly to many installations in various theaters of operation. This is the only regular means of getting this information to medical men on the front lines. Without exception these journals are distributed abroad and none is sent to any installation in the western hemisphere. The South American area is not included in the distribution of microfilms of medical journals. (3) The microfilms of published books. Rarely is there a request for microfilm of a published book by installations of the armed forces abroad. When such request is made, the permission of the publisher is obtained in each case before the work is done. Complete journals or books covered by copyright are not filmed for domestic use or in any case where the original material is available for purchase.

As the Army Medical Library is a war agency, requests for microfilms should be kept to an absolute minimum by every individual using the service. The Library reserves the right to scrutinize each request, taking into consideration the number of items included and the availability of the material in libraries accessible to the reader. The following priorities will be observed in filling requests: Medical Corps of the armed forces; Government libraries; research institutions and libraries; private individuals; commercial firms. The microfilm service is considered as an extension of the loan service in that it makes journals, bound and unbound, available to people of the medical profession everywhere without requiring them to visit Washington or to pay postage on heavy books mailed as library loans. It also saves wear and tear on material much of which is now irreplaceable.

# RECENT DIRECTIVES AND PUBLICATIONS

This list is intended as only a brief reference to the items mentioned. Before acting on any of them, the original communication should be read, and requests for copies, when made, should be directed to the source of the communication through proper channels.

J.A.G. Bulletin  
p. 126, vol. III  
No. 3. Mar. 44

Spectacles.—Enlisted men may not be held pecuniarily liable for loss or destruction of spectacles or dentures issued to them by Government. If such destruction or loss is through design or wilful negligence, AW 96 is violated.

WD Technical Manual  
TM 8-285  
15 Apr. 44

Treatment of Casualties from Chemical Agents. Recently revised, superseding TM 8-285 dated 27 November 1942. It is recommended that every medical officer study the latest edition which contains many new methods of treating gas casualties.

AR 600-45  
3 May 44

Purple Heart. Changes par. 16, AR 600-45, 22 Sept. 1943. Permits award to personnel severely frost-bitten while engaged in combat. Only one award to be made for two or more injuries or wounds received from one missile, force, explosion, or agent. Unsupported statement of wounded soldiers may be accepted in unusual circumstances when no corroborative evidence is obtainable.

AR 55-530  
4 May 1944

Hospital Ships.—Changes AR to provide that ship will be illumined at night, except in case where emergency requires ship be darkened.

Federal Register  
Vol. 9, No. 92  
10 May 1944  
page 1

Student Nurses.—Provides that student nurses transferred to federal hospitals in U. S. shall be paid \$60 per month for period of training requisite to graduation, provided that period of training in no case shall extend beyond period required for graduation by the institution from which student nurse was transferred, but may be terminated at any time prior thereto as the interests of service may require (Executive Order 9439).

ASF Headquarters  
Circular 135  
11 May 1944, Part  
One, Sect. IV.

Training.—Medical installations at Camp Grant and Camp Barkeley now designated as "ASF Training Center."

ASF Headquarters  
Circular 138  
12 May 1944  
Part One, Sect. II.

Medical Officers.—Makes provisions re maximum and efficient utilization of M.C. and A.N.C. personnel. S. G. responsible for distribution of such personnel among major organizational elements of A.S.F. Provides that S.G. may direct transfer of certain individuals by name from A.S.F. commands. Requisitions for M.C. officers to be submitted to A. G. through S. G. O.

CCH War Law Service  
Priorities, 12 May  
1944, 37335

Medical Furniture and Equipment. — Limitation Order No. L-214 amended to relax restrictions on use of zinc, alloy steel, and aluminum in manufacture of surgical furniture and related equipment.

WD Circular No. 187  
11 May 44  
Sect. I

Venereal Disease Report. Changes classification of Monthly Venereal Disease Statistical Report from confidential to restricted.

## Sect. VI

**Yellow Fever.** In accordance with agreements reached by W.D. with foreign governments, military and civilian personnel and others authorized to travel to or through endemic yellow fever areas will be vaccinated against yellow fever within four years and not less than ten days prior to entry into such areas. Sets forth yellow fever areas as defined by S.G.

WD Memo. No. W 40-44  
13 May 44

**Correspondence.** Correspondence received by W.D. relating to medical matters to be referred to S.G. for action. S.G. to refer such communications as he may consider proper to C.G. of A.A.F. or A.G.F. for direct reply and S.G. to be furnished with copy thereof. If such reply does not conform with policy, S.G. to inform headquarters concerned and Office of Chief of Staff.

WD Pamphlet No. 29-2  
POR  
15 May 44

**Oversea Movement.** Preparation for Oversea Movement of Individual Replacements is published.

WD Circular 198  
20 May 44

**Industrial Medical Program.** Sets forth functions and scope of industrial medical program in U. S. Army. Prescribes procedures at Army-operated arsenals, depots, and industrial plants and at Army-owned, contractor-operated plants. S.G. to establish policies and maintain advisory supervision of program for all components of Army. Lists specific functions of S.G.O.

WD Circular No. 201  
22 May 44  
Sect. III

**Mustering-Out Pay.** Provides that orders discharging or relieving officers from duty will state whether or not such discharge or relief from active duty is because of physical disability. Officer so discharged will not receive mustering-out pay until he receives written statement from A.G. that he will not be certified to Veterans' Administration for payment of retired pay.

AR 345-415  
22 May 44

**Daily Sick Report.** Makes provisions re entries therein: (1) when individual is sick in hospital, medical officer to enter "hospital" under disposition; (2) when released from hospital, medical officer to enter "sick in quarters" or "duty" under disposition; (3) individual's name not to be carried on daily sick report of his organization after date of transfer from local station hospital to another hospital. Provides also that injuries incurred in pursuance of private business not of a class authorized by W. D. shall be reported as originating not in line of duty.

WD Circular No. 205  
24 May 44

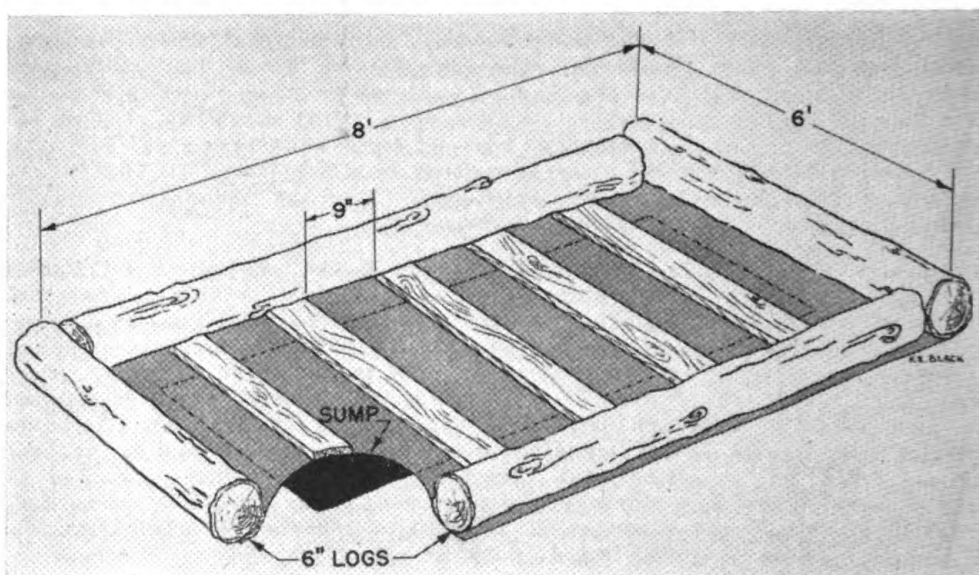
**Line of Duty.** Refers to AR 40-1025. Sets forth in detail instructions re determination of line of duty. Provides among other things that: (1) venereal disease proved to be contracted from spouse to be regarded as incurred in line of duty; (2) pay to be forfeited in venereal disease cases only where venereal disease was primary cause of admission to hospital; (3) Veterans' Regulation No. 1(a), Part I, par. I(b), as amended by Public Law 144, 78th Congress, to be followed in determining whether disability existed prior to or was aggravated by active service.

### BORAX IN FIRE BARRELS

At some stations fire barrels are emptied each week routinely to prevent mosquito breeding. This involves much labor and mosquitoes continue to breed when new water is added. In the April 1944 issue of the *Monthly Medical Bulletin* published by the Surgeon's Office, Headquarters, Ninth Service Command, it is pointed out that one pound of borax added to the water in each 50-gallon barrel will prevent mosquito breeding and make it unnecessary to empty the water for this purpose. While borax is effective, the inspection of the barrels should not be discontinued.

### GARBAGE SUMP MAT

The purpose of the garbage sump mat<sup>1</sup> illustrated here is to reduce the number of flies in the company area. The garbage sump is constructed according to standard practice and the needs of the particular situation. The mat cover is constructed from salvaged canvas and strips of lumber and four logs. The canvas was made 9 feet long by 6 feet wide to cover satisfactorily a sump 6 feet long by 4 feet wide. These dimensions are arbitrary. The size of the canvas may be modified to conform to various sizes of garbage sumps. Each end of



the canvas is tacked with roofing nails to logs cut to the same length as the width of the canvas. Batten strips of lumber 72 in. by 2 in. by  $\frac{1}{2}$  in. are tacked crosswise to the canvas at about 9-inch intervals throughout its length. These battens prevent the canvas from sagging. By rolling a log at either end, the canvas is rolled up on the log and the sump area is exposed. Two logs are laid lengthwise along the sides of the canvas to anchor it securely to the ground. By spraying the

1. Submitted as a field improvisation by Captain Maurice B. Johnston, M.C., of the 75th Medical Battalion, Armored.

sump with one of the many suitable spray materials and keeping the mat in place, flies can be greatly reduced in the company area. The use of the cover also increases the capacity of the sump by eliminating the dirt cover usually spread over each deposit.

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### THAILAND

Hua Hin is on the west coast of the Gulf of Siam, about 12 degrees north of the equator, in Thailand where natural food is plentiful. A large tuber, resembling a potato, is frequently eaten by natives when rice is scarce; however, unless processed it is "semipoisonous." After being buried in moist soil until it begins to mold, it may be cooked and eaten with no bad consequences. Uncooked vegetables in this area generally are not safe. Turtles and turtle eggs are found under the sand on the seaward side of sand dunes. The eggs are larger than hen's eggs. Bananas, mangoes, pomelos the size of grapefruit, and bamboo sprouts are plentiful. While rice cakes are sold by the natives, it is advisable to buy only those wrapped in banana leaves, as they will have been cooked inside the leaves without exposure to air and dust. Rice cakes not covered in this way are unfit for food.

Large packs of poisonous black snakes, about two feet long, resembling eels, abound in the water off Hua Hin, but are reported to be unable to bite man because of the smallness of their mouths. They may be driven off by flailing the water around them. The cobra and the krait generally will not bite unless stepped on or disturbed. They sometimes lie on paths. One should be careful in walking and not flail the grass, as that disturbs and makes them dangerous. The sting of the jellyfish in these waters is intensely painful and may be disabling and even fatal.

A vicious hornet, *Vespa orientalis*, inflicts a painful sting and five stings are considered fatal. An American who formerly practiced and taught medicine in Bangkok treated a patient who had been stung three times and was in a state of collapse. The bite of the "fire ant" also is extremely painful. It is most advisable never to sit on the jungle floor and to be exceedingly cautious about leaning against or climbing trees because of these insects.

The water buffalo dislikes the odor of white men and will attack them at almost every opportunity; however, those which have been domesticated by the natives will turn and run when one picks up a handful of dirt and throws it at them. The natives follow a religion which forbids them to kill animals, and hence they are numerous. The tiger or leopard is said to select a single specific victim and trail him if necessary for days, withholding the attack until conditions are ideal and the victim can be clearly seen. The most dangerous time of day is dusk, and the most dangerous time of year is the end of the dry season when these beasts follow small animals and birds that move toward the coast to obtain water.

### ABSORPTION OF PANTOPAQUE\*

Pantopaque has replaced lipiodol and the gases as the contrast medium for myelography in the Army Medical Department, chiefly because of its absorbability. However, the absorbability of pantopaque is not as rapid on all patients as was previously thought. Follow-up x-ray films were obtained on six patients at Walter Reed General Hospital showing that the absorption of pantopaque was not complete. These films included the skull, entire spine, and sacrum, and they were made at intervals ranging from nine to fifteen months with occasional intervening examinations. The amounts of residual pantopaque based on the size and number of collections shown on the x-ray films was estimated to vary from 0.1 to 1.5 cc. At the original examination, an average of  $3\frac{1}{2}$  cc. had been injected into the lumbar subarachnoid space. All of these patients had ruptured intervertebral disks removed surgically, but in no instance was the dura entered or any attempt to remove the residual pantopaque made during the operation. None of the patients had any symptoms referable to the residual material. In spite of previous reports that pantopaque is completely absorbed, it has thus been shown that some of it may remain for a considerable period of time.

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### MEDICAL KITS FOR AMERICAN PRISONERS OF WAR

The Army Medical Department has developed special medical supplies for shipment to the Far East in an effort to provide, despite unusual difficulties, the best possible care for American prisoners under control of the Japanese. These supplies have been designed for distribution by the International Red Cross. The new plan for making supplies available to American and Allied prisoners of the Japanese was developed in the Office of The Surgeon General, in collaboration with British, Canadian, and American Red Cross officials. Besides drugs, the shipments contain dressings, simple types of surgical and dental instruments, sterilizing equipment, insecticides, and water purifiers. The shipments are prepared in three types of units—a 100-Man Unit, a Hospital Unit, and a Bulk Supplies Unit. Ten 100-Man Units, plus the Hospital and Bulk Supplies Units, contain supplies believed to be sufficient for the needs of 1,000 men for three months.

About 126 different drugs are provided and each individual package of the 100-Man Unit contains instructions for use of the medicines. Laymen are cautioned to exercise care in using the medicines and do so on the advice of a physician or trained nurse if possible. The 100-Man Unit contains those drugs which can be best used by laymen, while the Hospital and Bulk Supplies Units are intended for installations where professional services may be available.

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\*Abstract of a paper by Lieut. Colonel Roy G. Spurling, M.C., and Captain George M. Wyatt, M.C., accepted for publication in *Surgery*.

Chairman Norman H. Davis\* of the American Red Cross, in a letter to Major General Norman T. Kirk, The Surgeon General, expressing gratitude for this work, said the booklet of instructions in the 100-Man Unit "will be of untold value to many prisoners in small working camps who have no doctor to attend them." In planning the contents, the committee of medical officers benefited by the advice of Dr. Charles N. Leech of the Rockefeller Institute in New York, who was interned for several months in the Philippine Islands after their conquest by the Japanese. As a result of the new plan, shipments of British, Canadian, and American medical supplies to prisoners of the Japanese in the future will be standardized and may be used interchangeably.

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#### RABIES IN INDIA

Rabies is of such importance in India that all medical officers should be aware of its existence in that part of the world. While dogs are the most important source of infection, according to the *Field Medical Bulletin*, Headquarters, Services of Supply, China-Burma-India (June 1944), rabies is prevalent also in jackals which abound in areas adjacent to populated districts. Dogs which are permitted to run at large mingle with jackals and may be infected by them. Antirabic vaccine is stocked in all section medical supply depots in that theater as well as Services of Supply hospital installations distantly removed from medical supply depots.

Dunham's *Military Preventive Medicine*, 3d edition, page 1039, states that the virus inoculated into a bite wound may be destroyed and the disease prevented by thorough disinfection of the tissues. The most effective disinfectant for this purpose is fuming nitric acid because of its diffusibility and penetration. The wound or wounds should be opened to the bottom and all lacerated tissue removed. The wound should be thoroughly cleansed with one of the usual disinfectant solutions and free bleeding should be encouraged. Then every part of the wound, including all pockets and recesses, should be thoroughly cauterized with fuming nitric acid, applied preferably with a glass rod. A general anesthetic may be given if necessary. As a rule, cauterization with fuming nitric acid does not produce any considerable amount of additional scar tissue if the acid is properly applied. If fuming nitric acid is not available, then the concentrated nitric acid (about 68 percent) should be used. The ordinary disinfectants, such as iodine or the phenol solutions, are of little or no value. The wound should be treated as soon as possible after infection, preferably within twelve hours, but treatment with fuming nitric acid is of value even when applied as late as forty-eight hours after exposure.

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\*Chairman Davis died on 2 July 1944.

The decision as to whether or not prophylactic treatment (antirabic vaccination) should be given must be made in accordance with conditions under which the biting occurred. Treatment should be given in every instance where there is reasonable likelihood that the person has been infected with rabies virus. When the bite is inflicted by a dog, the dog should be captured wherever possible and restrained by chaining within an inclosure that prevents access to other animals or children for fifteen days. If no symptoms develop during that period, it is safe to assume that the dog was not rabid at the time of biting and prophylactic treatment which has been started can with safety be discontinued. If the dog develops rabies or if it dies from any cause during the fifteen-day interval, the treatment should be completed. If the dog escapes capture, a complete prophylactic treatment should be given the bitten person. The prophylactic treatment should always be given to persons who have been bitten by wolves, coyotes, or other animals under conditions which justify the least suspicion that such animals are rabid.

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#### TRAINING IN RECONDITIONING TECHNIQUES

A program of physical and educational reconditioning activities has been established in all hospitals of the Army Service Forces. The responsibility for the operation of the program has been delegated to each service command and to the Military District of Washington. Personnel who are highly enthusiastic about the value of the reconditioning program are being selected for this work. To train personnel in techniques of reconditioning, courses of instruction are being established as follows:

1. At the School for Special and Morale Services, Lexington, Virginia:

- Course for physical reconditioning officers.

- Course for educational reconditioning officers.

- Course for educational reconditioning instructors (enlisted men).

2. At Camp Grant, Illinois, a School for Physical Reconditioning Instructors (enlisted men).

3. An emergency course is to be established in selected schools of occupational therapy to train young women, qualified in specified skills and techniques, to become occupational therapists. It is hoped that sufficient personnel for the proper operation of the reconditioning program of A.S.F. hospitals within the United States will have received appropriate technical instruction by the end of September 1944.



## AWARDS TO MEDICAL OFFICERS

The War Department has announced the award of the Legion of Merit to the following officers.

COLONEL ROBERT K. SIMPSON, M. C., Hunt, Texas, for performing "outstanding services from April 1941 to September 1943. As Surgeon of the AAF Gulf Coast Training Center and later of the AAF Central Flying Training Command, he procured more than 300 eminent physicians and surgeons for commission in the Army. He revised hospital plans in keeping with climatic conditions, designed infirmaries, and established an itinerant dental and veterinary service for civil contract schools. He organized and established schools for medical and postgraduate specialized training. He established air ambulance service for Matagorda Island and Peninsula, and recreation and convalescence areas. At the same time he provided medical service for indigent dependents of military personnel and a well-functioning consultation service for smaller outlying stations. He devised an efficient hand phorometer that can be packed in the Flight Surgeon's Physical Examining Set. All of his efforts contributed materially to the efficiency and orderly expansion of the Air Forces."

COLONEL WILLIAM L. WILSON, M. C., of Washington, D. C.: As Medical Staff Advisor of the Commanding General, Services of Supply, and later as Chief of the Hospitalization and Evacuation Branch, Headquarters, Army Service Forces, he displayed tireless energy, great resourcefulness, and military attainment of a high order in solving with sound judgment perplexing problems of hospitalization and evacuation of members for the armed forces. Through his tact, professional efficiency, and devotion to duty he laid the groundwork through which our troops are being hospitalized and evacuated efficiently from the theaters of operation. His exceptional common sense, devotion to duty, and loyal services were of inestimable value to the Commanding General, Army Service Forces

MAJOR BEN H. MERIWETHER, M. C., of Bartow, Florida: Services in New Guinea from 29 June to 11 September 1943. As commanding officer of a portable surgical hospital he displayed outstanding professional skill, unusual gallantry, and great disregard for personal safety and comfort. He organized and maintained his hospital unit as a model of efficiency after a difficult and hazardous landing at Nassau Bay and while exposed to enemy mortar, machine-gun, and sniper fire. During the entire campaign he selected and organized new positions for his hospital unit, moved over most difficult terrain, and succeeded in saving many lives of our wounded soldiers. While gaining the admiration of our troops for his bravery and efficiency he contributed largely to their welfare and morale.

CAPTAIN RICHARD FORD, M. C., of Boston Massachusetts: Service in New Guinea from 1 November 1942 to 1 April 1943. Serving as supply officer and as member of a surgical team of a portable surgical hospital during the Buna operations, he rendered exceptional services in saving the lives of many front-line troops. He contributed outstanding surgery when his surgical team functioned within range of enemy small-arms fire for a period of thirty-two days, and within 300 yards of enemy lines for a period of ten days. His extraordinary fidelity and unusual efficiency were of great value to the welfare of our troops.

FIRST LIEUT. JAMES V. DAVIS, M. C., of Port Angeles, Washington: When a U. S. Army transport was torpedoed in the Pacific in 1943, he remained on board after the order to abandon ship had been given, in order to treat the injured and supervise their transfer to the rescue ship. Without regard for his own welfare he administered and supervised all possible medical care and treatment on board the rescue ship until a port of New Caledonia was reached. In showing courage, fortitude, and indomitable will under hazardous conditions to save many lives with his professional skill he made an outstanding contribution to the welfare of the wounded and the morale of all personnel.

## Correspondence

### THEY KNEW THEY WERE NEEDED

Written by Lt. (j.g.) Colt T. Hendley, Jr., U. S. Coast Guard Reserve, and published in the Washington Evening Star, 20 June 1944. This condensation of the original story is published with permission.

*On board a Navy salvage tug, French Coast.*—Taking the beach to the east of the Carentan estuary was a grim affair for American troops and the amphibious craft transporting them. This is the story of a Coast Guard-manned LCI on 6 June, the day the sea-borne landings in France began. I was commanding officer of the ship and I want to describe what happened, so you can know what our soldiers and Navy beach battalion suffered in taking that beach.

On board were Navy and Army men whose job was to get the beach cleared of obstacles and handle the unloading of the amphibious craft. As we approached from the transport area, there were flashes from the warships ferreting out gun emplacements, and black puffs of shellfire on the water's edge. The area just off the beach was crowded with craft. The obstacles could be seen plainly over the whole of the beach, with small Teller mines attached to most of them. Some were submerged, some half out of water.

The ship headed in at around 12 knots. When the bow grounded, a mine exploded, ripping a hole in the forward part. One ramp went over, and a seaman went down to the beach with a line to assist the troops as they waded ashore. As the soldiers started down the ramp, the 88's began hitting the ship with shells that tore into the troop compartments. They exploded on the exposed deck. They smashed through the massed men trying to get down the ramp. Machine guns opened up. Finally, a hit finished off the ramp.

The ship backed off the beach after the ramp was destroyed and while standing off about 100 yards, the Army doctors on board and the Coast Guard's pharmacist's mates began doing what they could for the wounded. The ship had been hit about twenty-five times. The wounded and dead were transferred to the transport by cargo boom. The Army doctors and corpsmen who had stayed to help with the casualties climbed into a small boat furnished by the transport and headed for the beach which they had just left. They took their equipment and said nothing. They knew they were needed on the beach. How many of them are living now I do not know.

The ship backed away from the transport, and a salvage tug came alongside to determine whether she could be saved. Slowly she settled and began to turn on her side and finally she went over.

It had never before occurred to me that people who had ships sunk under them during the enormous amphibious operation which secured the first beachheads on the coast of France would be specially provided for. The survivor accommodation ship turned out to be an LST masquerading under a high-sounding name. Some of these lumbering, wonderful mechanized equipment carriers are outfitted with special medical equipment and personnel. After they have sent in their original load, they stand by the beaches until they have a load of casualties and survivors. The men from our ship were the first of almost 500 to be sent to her for transportation back to the United Kingdom. For three days we stayed off the French coast gathering the load.

## In Normandy

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American medical personnel administer first aid to soldiers wounded in attacking a beachhead in Northern France 9 June 1944.



American medical officer treats a wounded German prisoner on a beachhead in the invasion of Normandy. Signal Corps photographs.

## Special Articles

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# Laboratory Aids in Diagnosis of Rocky Mountain Spotted Fever

COLONEL HARRY PLOTZ

Medical Corps, Army of the United States

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The differential diagnosis of rickettsial diseases may be difficult especially when two or more different diseases occur in the same region. In the southern and southwestern parts of the United States where murine typhus and Rocky Mountain spotted fever exist side by side, confusion in diagnosis frequently occurs. This may happen in North Africa where epidemic and murine typhus and fièvre boutonneuse—a disease of the spotted fever group—may exist in the same region. Until recently, specific diagnosis in rickettsial diseases depended on the isolation and identification of the infectious agent in laboratory animals. This method is of course important, but it demands trained personnel and the maintenance of known rickettsial strains with which cross immunity tests can be carried out. Furthermore, it may take weeks before the agent is isolated in laboratory animals and identified by cross immunity experiments.

The Weil-Felix reaction has long been an important diagnostic aid in the diagnosis of certain rickettsial diseases. The value of this test, like other laboratory aids, depends on its proper interpretation. This reaction is based on the production by certain of the pathogenic rickettsiae of nonspecific agglutinins against the "O" or nonmotile variant of certain strains of *Proteus* X. The common strains used are OX 19, OX 2, and OX K. The characteristic result in epidemic and murine typhus as well as in Rocky Mountain spotted fever is an OX 19 agglutination and since high titers may occur in each of these diseases it is impossible to differentiate one from the other by means of this test. In tsutsugamushi (scrub typhus), on the other hand, an OX K agglutination is commonly obtained and, since this strain is not agglutinated in rising titer in any other known disease, its presence is of diagnostic significance. None of the *Proteus* X strains are agglutinated in Q fever, and guinea pigs that have gone through an infection with any of the rickettsial diseases do not develop a Weil-Felix reaction.

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See page 116.

While the presence of a high OX 2 agglutination is suggestive of Rocky Mountain spotted fever, a diagnosis based on this test alone is not possible. In this disease the OX 2 titer may occasionally be equal to or higher than the OX 19 titer, but there are other instances where there is no OX 2 agglutination whatsoever.

There are occasional cases of rickettsial disease where the Weil-Felix titer is very high (1:50,000 or more) but this is not the general rule. A titer of 1:640 to 1:5,120 final dilution is more frequently found. There are cases of typhus fever where the OX 19 titer may be low and does not exceed a titer of 1:160 even when several specimens taken during the disease are examined. Likewise, cases of scrub typhus have been studied where the OX K agglutination did not develop at any time during the course of the disease or convalescence.

The Weil-Felix test should be regarded as "positive" when a rise in titer has occurred after examining two or more specimens taken during the course of the disease. It is safer to follow this rule than to accept any single titer as being positive. An OX 19 agglutination of 1:320 in one specimen has less diagnostic significance than if the first specimen gave a titer of 1:160 followed by a second of 1:320. For this reason it is important to obtain a specimen of serum just as soon as a rickettsial disease is suspected. This specimen will serve as the base line and any rise in titer from this will be significant. This is particularly important in persons who have received typhus vaccine and who may have developed a low OX 19 titer by virtue of the administration of the vaccine alone. The appearance of the Weil-Felix reaction varies in individual cases. A rise in titer is usually obtained in the late febrile period and the titer rises in early convalescence to disappear in late convalescence. Since this antibody disappears in late convalescence the Weil-Felix agglutination cannot be used to demonstrate the existence of a past infection with a rickettsial disease.

Progress has been made during the last few years in the techniques of preparing specific rickettsial complement-fixing antigens for the diagnosis of rickettsial diseases. Bengtson<sup>1</sup> developed complement-fixing antigens from yolk sac cultures for Q fever and murine typhus. While complement-fixing antibodies were obtained in murine typhus with this antigen considerable cross fixation was noted with epidemic sera. Plotz<sup>3</sup> showed that by purification of rickettsial suspensions made from yolk sac cultures specific epidemic and murine antigens could be prepared with which differentiation between epidemic and murine typhus fever was possible. Plotz and Wert-

1. Bengtson, I. A.: Complement Fixation in "Q" Fever, *Proc. Soc. Exp. Biol.*, N. Y., 46:665-668, April 1941.

2. Bengtson, I. A.: Complement Fixation in Endemic Typhus Fever, *Pub. Health Rep.*, Wash., 56:649-653, 28 March 1941.

3. Plotz, H.: Complement Fixation Test in Rickettsial Diseases, *Science*, 97:20-21, 1 Jan. 1943.

man<sup>4</sup> developed a specific Rocky Mountain spotted fever antigen prepared from agar tissue cultures with which the disease could be diagnosed specifically.

Since the first results were reported, serial serum specimens from twenty-four cases of Rocky Mountain spotted fever were examined in the Division of Virus and Rickettsial Diseases at the Army Medical School. In order that the serological reactions obtained may be understood, a few cases of murine and epidemic typhus and five cases of Rocky Mountain spotted fever are included for discussion.

### *Murine typhus*

Case	Day of disease	Complement fixation*			Weil-Felix†	
		Rocky Mt. spotted fever	Epidemic	Murine	OX 19	OX 2
1	8	0	0	0	1/40	0
	31	0	0	1/320	1/640	0
	47	0	1/10	1/640	1/640	1/80
2	4	0	0	0	0	0
	19	0	0	1/40	1/640	1/80
	36	0	0	1/320	1/320	1/40
	57	0	1/10	1/320	1/80	0
3	12	0	0	0	1/1,280	1/80
	23	0	0	1/160	1/5,120	0

\*Initial serum dilution

†Final serum dilution

In these three cases of murine typhus, a rise in OX 19 titer occurred in all. While a low OX 2 titer was found in some specimens, the OX 19 titer was always higher. No specific diagnosis of murine typhus could be made on the OX 19 results alone. The complement fixation reactions using a Rocky Mountain spotted fever rickettsial antigen were negative while the murine antigen gave specific results. Occasionally some cross fixation occurs with an epidemic antigen but in all cases the titer obtained with the homologous antigen was higher. In these cases the diagnosis of murine typhus could have been made by means of specific complement fixation.

### *Epidemic typhus*

Case	Day of disease	Complement fixation*			Weil-Felix†	
		Rocky Mt. spotted fever	Epidemic	Murine	OX 19	OX 2
1	6	0	0	0	0	0
	8	0	0	0	0	0
	11	0	1/10	0	1/320	0
	12	0	1/40	0	1/640	1/40
	18	0	1/640	0	1/2,560	1/160

\*Initial serum dilution

†Final serum dilution

4. Plotz, H., and Wertman, K.: The Use of the Complement Fixation Test in Rocky Mountain Spotted Fever, *Science*, 95:441-442, 24 April 1942.

This protocol represents serological studies in a case of epidemic typhus fever that occurred in a nonvaccinated individual. In this case the serum samples taken on the 6th and 8th day of disease gave a negative Weil-Felix and complement-fixation reaction thus affording a good base line. On the 11th day the OX 19 titer rose to 1:320 and at that time the presence of a rickettsial disease was suspected but a specific diagnosis could not be made. The presence of a specific epidemic complement-fixation test on the 11th day of illness with a definite rise in titer on the 12th day permitted us to make a specific diagnosis of epidemic typhus fever. The complement-fixation reactions with a murine and Rocky Mountain spotted fever antigen were negative. The agent of epidemic typhus was isolated from this patient and identified some weeks later by cross immunity experiments and reactions in laboratory animals.

*Rocky Mountain spotted fever*

Case	Day of disease	Complement fixation*			Weil-Felix†	
		Rocky Mt. spotted fever	Epidemic	Murine	OX 19	OX 2
1	7	0	0	0	1/40	1/80
	11	1/160	0	0	1/80	1/1,280
2	5	0	0	0	0	0
	12	1/80	0	0	1/640	0
	64	1/320	0	0	1/160	0
	79	1/320	0	0	1/80	0
3	7	0	0	0	1/160	0
	14	1/160	0	0	1/640	0
	15	1/160	0	0	1/640	0
	21	1/320	0	0	1/640	0
4	13	0	0	0	0	0
	24	1/160	0	0	1/320	0
5	13	0	0	0	0	0
(Fatal)	16	1/40	0	0	0	0

\*Initial serum dilution

†Final serum dilution

The presence of a rickettsial disease could have been suspected in cases 1, 2, 3, and 4 after examination of the second serum sample, since there was a rise in OX 19 titer. Case 1 showed a rise in OX 2 titer in the second specimen of serum, and this titer exceeded that found for OX 19. There was no OX 2 agglutination in cases 2, 3, and 4. Case 5 was fatal on the 17th day of illness. A strain of Rocky Mountain spotted fever was isolated from the blood stream and the rickettsiae were grown in yolk sac cultures. This patient did not develop either an OX 19 or OX 2 agglutination before he died.

The complement-fixation reaction using an epidemic and murine antigen was uniformly negative in these cases. All cases, however, gave a specific complement-fixation test using a Rocky Mountain spotted fever rickettsial antigen. In each of these cases the early specimen was negative but it was followed by a positive test which gives significance to the results. A specific diagnosis of Rocky Mountain spotted fever could have been made on the 11th, 12th, 14th, 24th, and 16th day of disease in these cases. It is possible that an earlier diagnosis could have been made had specimens been obtained at more frequent intervals.

The complement-fixation test for Rocky Mountain spotted fever has become an important specific diagnostic aid in this disease. By means of this test differentiation between Rocky Mountain spotted fever and other rickettsial diseases is possible. Specimens of serum should be obtained as early in the disease as possible and again at frequent intervals until a specific diagnosis is made. About 5 cc. of sterile serum should be collected and shipped in sterile corked Wassermann tubes to the Division of Virus and Rickettsial Diseases, Army Medical School, Washington, D. C., where complement-fixation tests are performed routinely.

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## Plaster of Paris Casts and Splints

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The necessity for good plaster technique is emphasized during war. Great quantities of plaster of paris are being used for both the emergency and definitive care of many wounds. Although numerous cast materials have been recommended as a substitute, plaster of paris is still the most satisfactory cast material we possess.

Each step in the technique of utilizing plaster of paris clinically has been minutely analyzed. Many of the statements made in this article are based on the results of laboratory experiments and clinical studies.<sup>1</sup> In analyzing a large number of defective casts and splints, it became obvious that more of them were mediocre or inadequate because of poor technique of application than because of defective plaster of paris and crinoline. If the fundamentals of good plaster technique are followed, the resulting casts or splints should be strong, durable, relatively light, and free of pressure points.

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1. Luck, J. Vernon: Plaster of Paris Casts; An Experimental and Clinical Analysis, J.A.M.A., 124:23-29, 1 January 1944.



## ANALYSIS OF THE SETTING PROCESS

The setting of plaster of paris is the process by which, through the addition of water, the powdered plaster of paris (anhydrous calcium sulfate) is transformed to hydrated calcium sulfate, a solid crystalline form that exists in nature in large subterranean deposits. Heating the crystalline form (gypsum) drives off water of crystalization and a powder results:  $2(\text{Ca SO}_4 \cdot 2\text{H}_2\text{O}) \rightleftharpoons (\text{Ca SO}_4)_2 \cdot 2\text{H}_2\text{O} + 3\text{H}_2\text{O}$ . After removal of impurities and the addition of a substance to accelerate the setting time, the plaster of paris is ready for clinical use.

In observing the crystalization process microscopically, the powder granules, on being mixed with water, can be seen moving rapidly about. Soon the granules begin transforming to crystals which also move about. Gradually the motion slows and then a point is reached where the crystals begin interlocking. The phenomenon of interlocking ushers in the second half of the setting process; it marks the end of the fluid stage and the beginning of the solidifying stage. This halfway point is a critical point! It is critical in that the ultimate strength of the cast or splint depends upon a secure interlocking of the crystals, and this phenomenon will not occur if the plaster is materially disturbed following the "halfway point" in the setting process. This observation has profound practical significance. It means that by the time the "halfway point" appears, the cast or splint should be completed and held immobile until the plaster is rigid. The later in the second or solidifying stage the plaster is disturbed, the greater the damage to the strength. Of the experimental casts, those casts bent once after the "halfway point" in the setting process showed an average of a 77 percent reduction in strength. Changes in position of fracture fragments or joints subsequent to the "halfway point" should be scrupulously avoided. Identifying this critical "halfway point" that marks the onset of the solidifying stage requires repeated observations and differs somewhat with the various brands of plaster; but generally it may be considered as representing that point when the plaster has the consistency of thick cream or paste and its wet glistening character is giving way to a dull dry appearance.

Water in a drying plaster cast in excess of that utilized as water of crystalization, evaporates from the surfaces. In thin casts, drying may occur in a matter of hours, but in heavy casts drying may not be complete for many days or weeks, particularly in humid climates. It is important that air be permitted to circulate around the green cast. Heavy blankets placed directly over a wet cast can so disrupt the plaster as to make it rubbery and useless. The use of a cast drier for all heavy casts is desirable; in humid climates it may be indispensable. Casts do not attain maximum strength until dry through and through.

When testing the strength of experimental plaster cylinders by compressing them, water was squeezed out of several of the cylinders that appeared quite dry on their surfaces. It took seven days of drying to be sure that all excess water had evaporated.

#### THE SETTING TIME

Varying the temperature of the water in which the plaster is soaked produces considerable variation in the length of the setting time, hot water shortening the time and cold water lengthening it. Using water cooled to 40° F. and a soaking time of one to three minutes, the setting time is about three times as long as when the plaster is soaked in water at 125° F. Advantage can be taken of this characteristic of plaster of paris in adjusting the length of the setting time to the cast at hand. In the case of large casts the setting time needs to be considerably longer than is required when only small casts or splints are made.

The use of chemicals such as salt to accelerate the setting time and sugar to retard it must be condemned under most circumstances. Such chemicals frequently impair the strength of the plaster. Altering the temperature of the water and the soaking time is usually a more satisfactory method of controlling the setting time. Plaster that cannot thus be brought to a satisfactory setting time should be replaced by plaster with the correct setting time.

The proper length of the soaking time is generally said to be that time required for bubbles to cease rising to the surface. But with this method the time of soaking is subject to wide variation. Whether bubbles rise from the plaster rolls for a few seconds or several minutes depends on how tightly the crinoline is rolled. If the rolls do not soak completely within one minute, they are too tightly rolled. Dry spots mean the crinoline is rolled too tightly; telescoping means it is too loosely rolled. Soaking the plaster longer than usual and until it is creamy has the advantage of preventing loss of plaster during wringing, but the plaster then has the serious disadvantage of being near the "halfway point" in the setting process and therefore must be very quickly used. Under most circumstances, plaster is best soaked from a few seconds to one minute in water from 70° F. to 95° F.

Not more than six or eight average-sized rolls of plaster-crinoline should be soaked in a given bucket of water, and the bucket should be three-fourths filled. When the soaking water becomes concentrated with plaster of paris, the setting time of the plaster in the rolls then soaked is considerably shortened. The crystalized plaster is one of the most effective accelerators of the setting process. Care should be taken to keep the water as free of plaster as possible and rolls should be placed in the water and removed from it with little loss of plaster. Drain the roll or splint in an adjacent basin rather

than into the soaking water and allow the water to drain briefly before gently shaking and compressing the ends of the roll. Forceful compression of a roll immediately upon its removal from the bucket can express out as much as half the plaster content. If a delay occurs during application of a cast and the rolls in soaking pass the "halfway point" in the setting process, such rolls should be, without hesitation, discarded. Their use only weakens the cast.

#### TECHNIQUE OF APPLYING PLASTER OF PARIS

In the padding of casts, the trend has been toward the use of a minimum of padding in place of the heavy padding that was once popular. To dispense with all padding is not recommended for the little experienced or in circumstances when the patient will not be under close observation. Padding with stockinet, with or without sheet-wadding, is compatible with excellent cast technique. Excessively thick padding invites pressure and friction points, and movement of fracture fragments. In the series of defective casts studied, painful points occurred more frequently beneath thickly padded casts than beneath casts with thin padding. When padding is thick, there is a tendency to draw the plaster on in place of laying it on, and tension on the plaster bandage as it is being applied has a localized constricting effect which can have serious consequences. One of the most important points in correct plaster technique is to lay the bandage on smoothly without tension.

Rubbing the plaster as it is applied is sufficient to cause adjacent layers to fuse together, a feature essential to maximum strength. When the component layers of a cast or splint fail to adhere to each other, lamination and a weakened cast result. This usually results from too slow an application or too rapidly setting plaster. Plaster rolls and splints should be applied as quickly as is compatible with good technique, but the operator should not be rushed by too fast setting plaster.

Joints and fracture fragments should be placed in their proper position and alignment prior to beginning the cast. Altering joints and fractures during the first half of the setting process invites wrinkles and pressure points. Repositioning a part after the "halfway point" produces pressure sites and in addition weakens the cast. When sufficient fracture equipment and assistance are not available, large casts may be better applied in segments. For example, when encasing a fractured shaft of the tibia, it is frequently best to apply a thin plaster cylinder from the ankle to the knee, allow it to set solidly, then apply the foot and thigh portions of the cast. By making deep scratches in the cylinder, a satisfactory fusion between the segments of the cast can be expected to occur.

Heavy rubbing and molding of a cast after the "halfway point" is reached is detrimental rather than useful and should be limited to the period of application of the plaster. Lightly rubbing a plaster paste on the surface to "finish" the cast does no harm but is best done when the cast is wet. If done after the surface is hard and dry, the surface plaster often cracks off.

After the application of a large cast such as a hip or shoulder spica, the patient should not be moved until the cast is well set. Many casts are bent and extensively damaged by moving the patient to a litter and into his bed before the cast is sufficiently rigid.

Bivalving, wedging, and making windows are best deferred until the cast is thoroughly dry. In those instances when a cast must be split or bivalved while it is yet "green," the cuts in the plaster should be made with a thin-bladed, sharp knife and the plaster disturbed as little as possible. Wedging of casts to correct alignment of long bones is an excellent procedure and should be employed whenever the position of plaster-encased fractures of the long bones is good and the alignment unsatisfactory. The cast is cut transversely for half or more of its circumference at the fracture site on the concave side of the "bowed fragments." After aligning the fracture, a cork or block of wood is placed into the wedge-shaped gap in the cast to retain the new alignment. If x-rays disclose good alignment, the gap is filled in well with a roll of plaster.

The proper sites for the reinforcement of the various plaster of paris casts were studied experimentally and clinically. It was found that when reinforcing those casts which encase joints moving predominately in one plane (knee, ankle, elbow, wrist), the reinforcing plaster splints should be placed anteriorly and posteriorly, rather than laterally and medially. Splints placed front and back made experimental casts about one-third stronger than when similar splints were incorporated into the sides of the cast. Tests also indicated that the reinforcing splints add more strength to the cast when narrow and thick than when wide and thin. This means that a plaster splint 6 inches wide and six layers thick contributes more to the cast if folded longitudinally to make a splint 3 inches wide and twelve layers thick.

If wooden, metal, or other types of nonplaster splints are incorporated into the cast, they should be perforated or notched to key them into the cast. When plaster slabs or splints are used alone and wrapped in place with nonplaster bandages, the mechanical principles dictating their proper application are opposite in some respects to the principles involved when splints are incorporated into casts. Splints or slabs used alone are much stronger when wide and thin than when narrow and thick. The splint or slab should extend

from anterior or posterior well onto the sides of the part being splinted or be placed directly on the sides. When it is certain that a cast is to be bivalved or split, it should be reinforced more on the sides than on front and back. The junction of the pelvic and lower extremity portions of a hip spica should be given more reinforcement laterally than the front and back. This is due to the fact that the lower extremity portion of the cast does not join the pelvic part of the cast throughout its circumference. In a shoulder spica the arm portion of the cast joins the chest part of the cast throughout the shoulder's circumference; therefore, if the patient is to sit or stand, the major reinforcement is best placed over the top of the shoulder and from the inner aspect of the arm across the axilla.

#### SUMMARY

Plaster of paris is our most valuable medium for the immobilization of many wounds, but its physicochemical characteristics must be understood and respected in order to obtain the best results from its clinical applications. These characteristics have been reviewed in the light of their relation to good plaster technique.

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## Medical Service in the New Georgia Campaign

(A portion of a report to the Surgeon, U. S. Army Forces in the South Pacific Area)

The New Georgia campaign was a combined operation of Army, Navy, Marine, and Air Forces whose mission was to land on Rendova, Vanguna, and New Georgia, seize Munda field, and drive the Japanese from New Georgia and adjacent islands. The operations were completed on 22 September 1943. The following phases are mentioned so far as they were reflected in the medical service: (1) initial landing phase starting with landings at Wickham, Viru, Segi, and on Rendova, followed by establishment of beachheads at Zanana and Laiana on New Georgia; (2) attack on Japanese defensive positions along coastal strip by — from Laiana Beach; (3) co-ordinated attack by — ending with seizure of Munda Field on 5 August; (4) mopping up of Japanese along west coast of New Georgia in vicinity of Enogai Inlet and Bairoko; and (5) driving Japanese from adjacent islands.

In the initial task force, one clearing platoon covered the medical service of the force which landed at Wickham on Vanguna Island off the lower tip of New Georgia. Collecting company detachments covered the landings at Viru and Segi. A clearing platoon of a clearing company of a medical bat-

talion covered the main body of troops landing at Rendova which lies five miles off New Georgia.

When combat forces moved up they contained a medical collecting company but no clearing company elements. One platoon of the clearing company moved to New Georgia with other combat forces, establishing a clearing station in the vicinity of the command post. Another medical clearing platoon was moved to Vella Lavella to cover the clearing station needs of infantry at that station. Other combat forces moved to the New Georgia area, with two medical collecting companies and one clearing company. The clearing company established a clearing station on Kokorana Island just off Rendova.

A forward echelon moved to Rendova and took command of the New Georgia occupation force. A chief surgeon, the only representative of the medical section, was attached to the G-4 section of headquarters. One week later a medical inspector and two enlisted clerks arrived and the medical section consisting of two officers and two enlisted men was set up. This abbreviated section functioned as such throughout the campaign; additional personnel was not sent from the rear echelon because it was anticipated that a new Table of Organization would be put into effect.

A field hospital, less one platoon, was requested to be sent to cover urgent hospital needs. In July, the officer and enlisted personnel of one platoon of the field hospital arrived at Rendova, having been requested prior to our arrival and intended for use as replacements. Rather than deplete the personnel of an urgently needed hospital, I attached this personnel to the clearing station of forces on temporary duty until another field hospital arrived and opened up on Kokorana Island. I requested that a section of an advance platoon of a medical supply depot be sent to New Georgia and it arrived with full complement of officers and men on 4 September, bringing also thirty-day medical maintenance supplies for this base. A medical supply depot was established on New Georgia within  $\frac{1}{4}$ -mile of the principal supply beach. With the exception of normal medical attachments of service units moving in after the active combat phase was completed, no further medical units were sent to this base.

#### EVACUATION

This section of the report will cover principally evacuation to the rear of divisional medical installations. Evacuation from positions at Wickham, Segi, and Viru was by returning supply boats during the entire campaign. A few casualties were evacuated from Segi by air, since the fighter strip was placed in operation. Evacuation from the forces in the vicinity of Rice Anchorage and Enogai Inlet was by returning supply boats. On several occasions evacuation of casualties was accomplished by PBI amphibious planes. Evacuation

from Vella Lavella was by returning supply boats. A few casualties recently were brought by returning PT boats, and some others have been evacuated by air since the fighter strip has been placed in operation. As yet, there has been no evacuation routinely to New Georgia from Vella nor have casualties evacuated by air been transferred to hospitals at this base, but have gone on through.

*Evacuation by water within the New Georgia-Rendova area.* All evacuation from divisional medical installations during the initial phases of the campaign was by water from the mainland of New Georgia, from the beaches at Zanana and Laiana to the Rendova clearing station. Transportation was almost entirely by returning supply boats, and in only a few instances were casualties transported in boats assigned for that particular purpose. Nondivisional and Navy units cleared their patients by unit-assigned boats to the clearing station. On 28 July, a field hospital opened on Kokorana and thereafter all units, except one force, evacuated to this field hospital by returning supply boats. One unit's clearing station, having been the sole evacuating agency in this area prior to that time, was directed to continue to be the evacuating agency of that unit and was not required to evacuate through the field hospital, principally because of the limited hospital facilities.

It was not practicable to move this field hospital to New Georgia until after Munda Field had been seized and passable roads constructed along the coastal strip. One platoon of the hospital moved to New Georgia, opening a hospital north of the airfield on 6 September, the other platoon continuing to operate on Kokorana until about one week later. When it became possible to evacuate by air or by landing ship tanks on New Georgia, evacuation by water within this area was limited after the field hospital opened on the mainland. Outlying units on neighboring islands and from Bairoko continued to evacuate by supply boats to the field hospital. Evacuation from the field hospital was by boat to — until about 6 September, when LST's regularly unloaded on a beach on the mainland.

*Evacuation by water to the rear.* This has been accomplished by returning LST's. For the first four weeks, each LST had but one naval medical officer aboard to handle casualties, which were too many for one officer since during the early days many casualties went aboard without more than simple first-aid treatment. Casualties incurred at the hands of enemy ground forces were handled satisfactorily, but bombings of our beachheads produced more casualties than the limited medical facilities could handle during the first week of the operations.

During the first month, LST's arriving with troops and supplies were unloaded at beaches on two islands off Rendova. Careful coordination was necessary to time the arrival of evacuees at the boat immediately after the boat was unloaded, the

tank deck cleaned, and cots made ready. Frequently the boats were not unloaded until close to sailing time. The evacuees were then loaded hurriedly, so that proper exchange of litters, splints, and blankets was not accomplished and our supplies were depleted. On one occasion, patients were transferred to a departing LST from a landing craft tank in midstream after dark during a heavy rain.

Evacuation of casualties by water was accomplished without loss of life due to enemy action. However, once shortly after evacuees had been placed aboard an LST, an enemy air raid resulted in bombing the LST, with several additional injuries incurred by evacuees as a result of bomb fragments or of strafing. All patients were hurriedly transferred to a nearby LST which sailed shortly. I was on the LST which was to be bombed, but sought shelter on the beach and assisted in the transfer of patients as soon as the enemy planes had been driven off. It was during this raid that a medical captain of Admiral Nimitz's headquarters was killed.

The time required by the LST's to make the return trip averaged twenty hours, but operational difficulties during the first week or two resulted in delays up to twenty-four hours. Many casualties having received but slight first-aid treatment at Rendova did not reach base medical installations until seventy-two to eighty-four hours after injury. The time factor and the limited medical facilities aboard the LST's resulted in wound infections and contributed to the incidence of gas gangrene infections in the early days of the campaign.

On my arrival at Rendova on 14 July, steps were taken to ensure that all evacuees had proper medical or surgical attention before being evacuated and that no patients were placed aboard the LST's until properly cleared through local medical installations. It was recommended that additional medical supplies be carried aboard the LST's so that adequate treatment of casualties could be given en route. By 25 July, an additional Navy medical officer was placed aboard each LST, thereby providing for better care of casualties which were evacuated.

It is felt that more careful planning would have prevented the deficiencies present during the first two or three weeks of the campaign. However, considering the limited medical facilities, the shortage of medical officers, and operational difficulties beyond control of the Medical Department, it is believed that every effort was made to accomplish the most for the greatest number. In an effort to provide adequate care for all who needed attention, there was a laxity in screening the stragglers and others obviously not eligible for evacuation, resulting in unwarranted loss of personnel from combat units.

*Evacuation by air.* From 1 July to 14 August, several casualties were evacuated by returning administrative amphibian planes. These were limited to individuals whose condition



warranted definitive treatment at the rear areas with a minimum of delay.

Munda Field was taken, the strip placed in repair shortly, and the first transport plane landed on 15 August, on which day the first casualties were evacuated. Limited facilities were available irregularly the remainder of August, but more than 100 patients were evacuated. During September many more patients were evacuated by air. Because of water transportation facilities and the time factor in getting patients to the field on extremely short notice, the fullest advantage of air evacuation facilities could not be taken until the field hospital was moved to New Georgia on 6 September.

In the meantime Navy and Marine medical installations in the vicinity of the field evacuated their casualties by air. Since air facilities cannot handle all of our evacuation requirements, it is important that only those whose condition warrants rapid evacuation to the rear be transported in this manner.

#### MEDICAL SUPPLY

The initial medical supply plans for the operations were the responsibility of the combat commander in conjunction with the Navy task force. A higher headquarters was charged with the responsibility of furnishing the medical supplies and equipment for the operations but had no part in the supply plan. The original plan provided that complete T/BA\* equipment would be on hand, plus additional non-T/BA equipment deemed necessary for the operations, and that sixty days' medical maintenance supplies be available, thirty days' supply to be carried by units with thirty days' supply to be in reserve to be forwarded as soon as practicable. It was also planned that a sixty-day level of medical maintenance supplies be maintained. In addition, certain supplies which could be expected to be expended at an abnormally high rate in combat were to be supplied in amounts about ten times the normal maintenance allowances. These included the sulfonamides, dried blood plasma, intravenous saline and glucose solutions, battle dressings, morphine Syrettes, first-aid packets, plaster, adhesive plaster, and tetanus toxoid. Individual jungle medical kits were to be supplied on the basis of one per officer and Medical Department soldier and one per four men other than Medical Department.

As far as possible, the necessary medical supplies and equipment were furnished from a medical supply depot or from the rear. However, in an attempt to secure medical supplies far in excess of anticipated needs, duplication of requisitions resulted, and supplies were furnished not only from an advanced base but also similar supplies were sent direct from the rear. Because of the fact that medical supplies were available only from one to three weeks prior to the beginning of the campaign, some last-minute confusion resulted.

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\*Table of Basic Allowances.

The medical supply problems of one combat force during the period 30 June to 28 July are discussed in some detail, principally to bring out the deficiencies which resulted from improper planning and subsequent handling of supplies. This is extremely important, since during this period this force was charged not only with the responsibility for its own supply but for the entire New Georgia occupation force.

A tendency existed on the part of the force to secure medical supplies not only in amounts for anticipated needs, but far in excess of needs, so that adequate quantities would be available to cover any contingency. This was due, in part, to the fact that limited medical supply facilities in the past had resulted in the force receiving but a portion of requisitioned supplies. Supply agencies had attempted to fill all reasonable requests and, with the exception of obviously excessive requisitions, all supplies were furnished. Add to this the separate medical supply sent direct from the rear and it can be seen that medical supply was more than adequate. Supplies were freshly issued, apparently not according to actual needs but according to the tendency to take all they could get. Original containers, in many instances, were not opened, nor were the contents itemized.

On the initial move, water transportation was at a premium. Adequate cubage and tonnage data on supplies and impedimenta apparently had not been taken into consideration. Estimates were made on the basis of days of supply rather than on actual stocks on hand. As a result, units arrived on the beaches with more impedimenta than could be accommodated on assigned water transportation. Many supplies were left on the beaches to follow at a later date. Needless to say, the bulk of medical supplies did not accompany the troops on the initial move. Critical items of supply as yet unpacked were left on the beaches, in vehicles to be brought later, or were placed in unit dumps. Instead of thirty days' medical maintenance supplies accompanying units, it is estimated that but ten days' supplies were brought along. Of the supplies accompanying troops, containers were not sufficiently clearly marked to show contents, and medical supplies became hopelessly mixed in ration, fuel, and ammunition dumps. In less than three days, radiographic requests for additional medical supplies were received at the advanced base, indicating there had been a serious breakdown in medical supply along the line, already anticipated by us in view of all that had taken place during the planning and preparatory stages. A few medical supplies had been destroyed by enemy action, but this was a minor factor. Emergency requests were filled and limited supplies flown to New Georgia.

When I arrived at Rendova with a headquarters, an immediate investigation of the medical supply situation was made. The force there did not know what supplies were on

hand, what had become of supplies left at the rear, where the reserve supplies were located, nor was the medical supply distributing point adequately organized. Supplies were scattered on various beaches. The medical supply officer had been left at the Russell Islands to handle the medical supply of the garrison there as well as the forces at other islands and to close out his installation at a later date, moving the remainder of his stock to Rendova on call. While the emergency needs of units in the field were being adequately covered, it was apparent that the supply situation was out of control. I directed that all beaches and task force dumps be searched for medical supplies, these to be transported to a central medical supply dump in the vicinity of the clearing station on Hester Beach, that a cursory inventory be taken, and that a list of emergency needs be furnished my office without delay. This was accomplished and a radiographic request for medical supplies was sent to the advanced base. Radiographic requests for forwarding medical supplies left at rear areas were dispatched, and a continued search for the bulk of the medical supplies was made.

One month after the operations started, the medical supply officer came in from the Russells, on his own initiative, but brought no supplies because of lack of transportation facilities. He stated that 75 tons of medical supplies were at the Russells. A radiographic request for immediate shipment was dispatched and these arrived about 5 August. A cursory inventory was made and critical items of supply were very few. In the meantime, a thirty-day medical maintenance allowance had been sent from the advanced base. The combat force was relieved of medical supply responsibilities for troops other than its own, and at that late date medical supply began to function in an orderly manner.

Biologicals, mostly gas gangrene antitoxin and tetanus toxoid, were requisitioned by radio and forwarded by air. It was difficult to get the combat force to anticipate its medical supply needs, thereby eliminating the necessity for frequent emergency radiographic requisitions to the rear.

An example of improper distribution of supplies was uncovered after the combat force medical supply officer had put in an emergency request for tetanus toxoid, stating that none was on hand. Three days later, the medical inspector, while visiting a field artillery battalion, found they had 1,500 cc. of tetanus toxoid on hand, while in thirty days they had used but 1 cc. The medical supply officer was unaware of this stock which would have covered his needs for the campaign.

While at no time was medical service impaired because of a lack of medical supplies, it is obvious that the medical supplies were handled in an unsatisfactory manner in every respect. Many lessons can be learned. In the first place, a definite supply level must be followed and maintained. The

acquisition of excessive supplies results in a bogging down of medical units, unable to move because of the limited transportation facilities. All containers should be clearly marked to show nature and quantities of contents. Critical items should be separated and remain in the hands of Medical Department personnel and not allowed to become scattered on beaches or hopelessly mixed with other types of supply. A medical supply dump must be established under adequate supervision. All medical supplies in reserve should be in a central location, stored for ready issue, and an accurate inventory kept at all times. The current T/O's do not provide sufficient personnel in the headquarters detachment, medical battalion, to handle adequately a division's medical supply. The supply section should handle medical supply alone, and additional personnel provided to cover general supply duties. However, on New Georgia it is not believed that available personnel was used to the best advantage, nor that additional personnel could have handled the situation unless there had been better planning and more adequate supervision.

Another combat unit complied with the directive that thirty days' medical maintenance supply accompany troops and that thirty days' supply follow, maintaining a sixty-day level; and no difficulty was encountered other than emergency needs for biologicals and litters. Medical supply functions were adequately handled by augmenting the medical supply section. Monthly maintenance supplies were adequate. In still another force, there were excellent planning and medical supply coverage, but biologicals and litters were needed.

The field hospital brought adequate supplies with unit but required biologicals and litters. Medical maintenance unit was based on normal allowances for troops for thirty days. The field hospital supplied attached troops with medical supplies, thereby relieving the combat unit of this responsibility. Furthermore, medical supplies and equipment sent direct to me were placed in the field hospital for distribution at a later date. This was particularly true for biologicals, litters, and items of Quartermaster issue.

A section of an advance depot platoon, medical supply depot, arrived at New Georgia early in September, bringing thirty days' medical maintenance supplies for the base. The depot has operated quite efficiently since that time, supplying all Army units at this base from the day it opened. Toward the close of the campaign when it was indicated that the combat units would move to the rear, I contacted all forces, directing that they check their medical supplies and equipment, turning in to the medical supply depot all surplus supplies and unserviceable equipment for salvage. It was felt that this would give the units an opportunity to dispose of supplies and equipment, turning in to the medical supply depot all surplus

supplies and unserviceable equipment. This obviated the possibility that many supplies might be discarded in scattered areas as the units moved out. The plan worked well, and it is estimated that about 30 tons of supplies were turned in, many of them critical items and others quite essential for hospital use but impractical for field units.

## Nomogram for Computing Morbidity and Mortality Rates

The computation of annual admission rates per 1,000 strength from weekly data is performed by the following formula:

$$\frac{52,000 C}{S}$$

where C is the number of cases and S is the mean strength. The rationale of this formula is that multiplying the number of cases in the week by 52 produces the number of cases which would occur in a year if the same experience prevailed; then dividing by the strength gives the annual rate of admission on this basis (the constant factor 52,000 is used instead of 52 to produce a rate per thousand). The computation of rates by this formula is laborious when performed manually. While the computations may readily be done on modern calculating machines, these are not readily available at most stations.

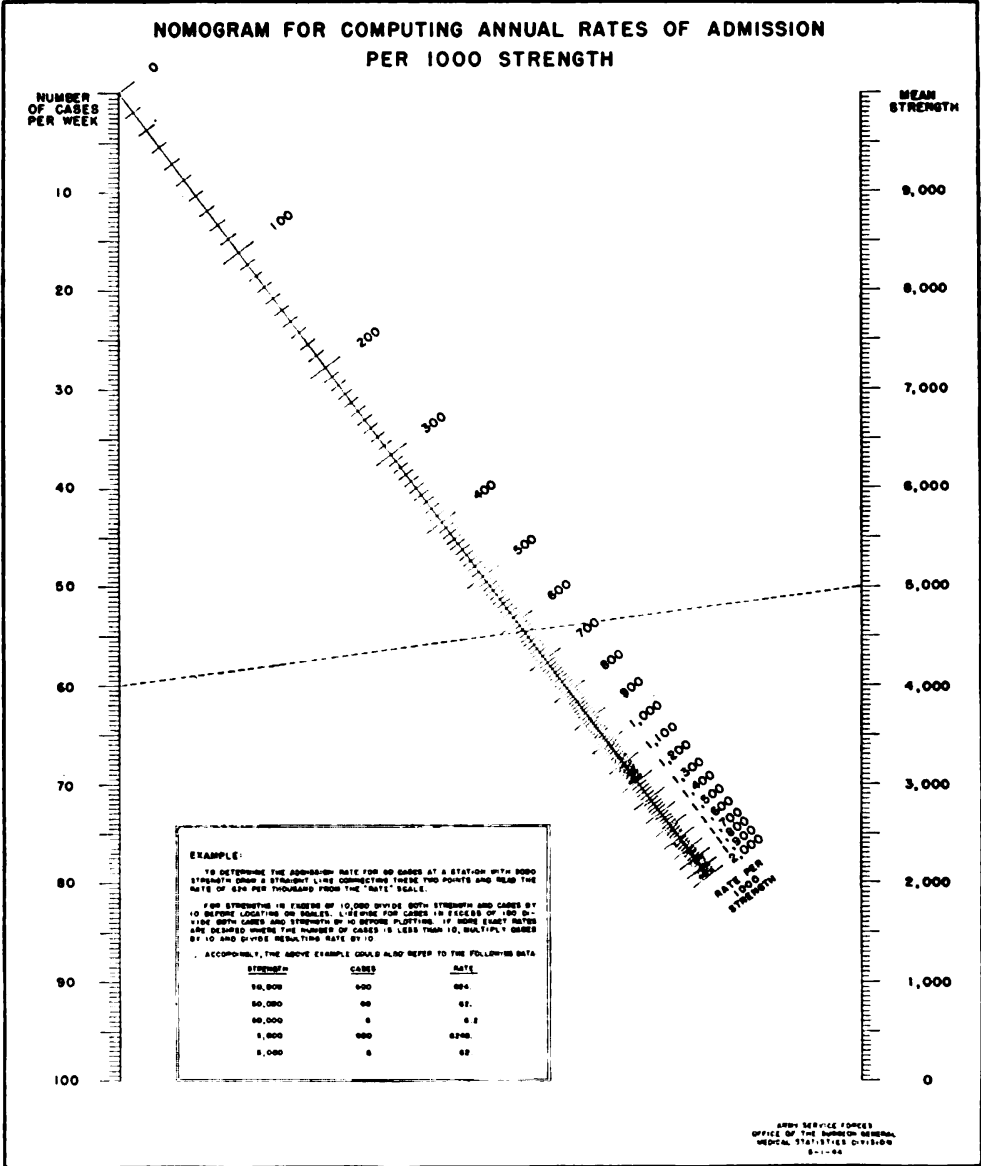
With the nomogram or computing chart shown here, the annual rates of admission can be calculated in a much less tedious fashion than by longhand computation. With this chart and a ruler, annual rates of admission per 1,000 strength are obtained by connecting the point for the number of weekly cases on the left-hand scale with the point for the mean strength on the right-hand scale and reading off the rate on the middle diagonal scale. Rates accurate within about 1 percent can be calculated from this nomogram if it is enlarged to about 12 by 15 inches. This should prove sufficiently accurate for the purposes prescribed by AR 40-1080.<sup>1</sup>

To illustrate the method of using the nomogram, let it be assumed that the admission rate is required for 60 cases for a particular disease at a station of 5,000 strength. The dotted straight line shown on the chart connects the two data points, and the intersection with the diagonal "rate" line is at about 625 per thousand (actually by computation the correct rate is 624 per thousand). Although the given "strength" line goes up to only 10,000 and the number of cases only to 100, rates may

Prepared in the Medical Statistics Division of The Surgeon General's Office, where enlarged copies of this nomogram may be obtained on request.

1. Section VIII of AR 40-1080 requires that annual admission rates for various diseases be maintained for each post, camp, or station, with an average strength of 1,000 or more in respect to the current weekly data from the Statistical Health Report, MD Form 86ab.

readily be determined for data beyond these points by adjustment of the decimal point in the "rate" line. For example, if the strength were 50,000 and the cases 600, the straight line would connect the point for 5,000 strength with the point for 60 cases, and since both are divided by 10 in plotting, the scale on the "rate" line would be read as it appears. On the other hand, for



a strength of 50,000 with 60 cases reported, the strength being plotted as 5,000 (having been divided by 10), the resulting value on the "rate" line would also have to be divided by 10, producing a rate of 62 per thousand. Correspondingly, where the number of cases is 10 or less, more accurate rates may be obtained by multiplying the number of cases by 10 and plotting this value; then the resulting value on the "rate" line must also be divided by 10. For instance, the dotted line equally refers to an instance

of 6 cases and 5,000 strength, resulting in a rate of 62 per thousand.

Noneffective rates could also be computed by a nomogram of this kind,<sup>2</sup> but for a slow-changing statistic such as the noneffective rate, a greater number of significant figures than are obtainable from such a chart would be desirable.

#### MATHEMATICAL THEORY

Considering the nomogram under discussion plotted on coordinate paper with the lower left-hand corner (i.e., the point representing 100 on the "cases" line) being the origin and denoting by "h" the height in inches of the "cases" line (or equally the "strength" line) and by "w" the distance between the "cases" and the "strength" lines, the equations of the three lines are as follows:

1. "Cases" line .....  $x=0$
2. "Strength" line .....  $x=w$
3. "Rate" line .....  $hx+wy=hw$

The scale on these lines is determined as follows:

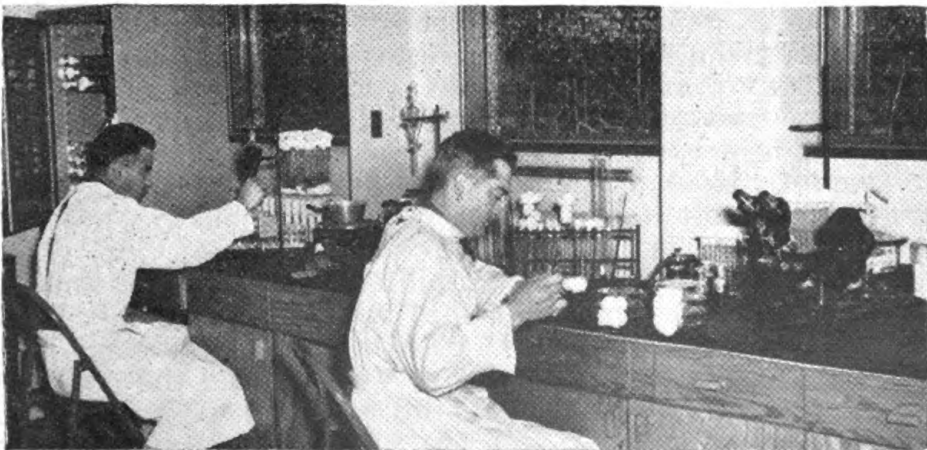
1. "Cases" line. The zero point is the top of the line and the highest number of cases desired to be shown is taken to be the bottom point with the intervening points obtained by equal linear interpolation.

2. "Strength" line. Determined in the same fashion as the "cases" line except that the zero point is the bottom of the line.

3. "Rate" line. For each value of the annual rate of admission per 1,000 strength (denoted by "R") desired to be plotted on the scale, the point is determined by the following formula where "C" is the highest number of cases used on the "cases" line, "S" is the highest strength shown, and " $d_R$ " is the distance on the diagonal line measuring from the zero point of the "cases" line:

$$d_R = \frac{RS\sqrt{h^2 + w^2}}{RS + 52,000 C}$$

2. In fact, this chart could be used for computing noneffective rates if the left-hand line represented total days lost during the week and the scale ran from 0 at the top to 3,640 at the bottom. Then the noneffective rate could be obtained by connecting the number of days and the mean strength with a straight line. The value then read from the "rate" line after being divided by 10 would be the required rate. For example, the dotted line relates to 5,000 strength and 2,184 days (0.60 times 3,640) resulting in noneffective rate of 62.4 per thousand.



U. S. Army veterinary laboratory in the University of Iceland. Signal Corps photograph.

## Original Articles

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### Anesthesia in the Combat Zone

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Medical Corps, Army of the United States

This report is based on 504 anesthetic procedures personally conducted within the combat zone as anesthetist on a general surgical team of an auxiliary surgical group. This team functioned in different medical installations during 1943 including beachhead provisional installations, field, and evacuation hospitals. Most of the major injuries were treated in the most forward installations. The remainder of the work was carried out in hospitals which received patients after their initial treatment and from twenty-four to seventy-two hours or longer after the injury was incurred.

In choosing the proper anesthetic for battle casualties it is most important to adjudge the close relation of anesthesia to shock. The great majority of patients accepted for "first priority" surgery in the most forward installations are in shock. When shock is not demonstrable, the factors which provoke shock may be present and become manifest by the administration of an anesthetic. The anesthetist and medical officers treating shock share in the responsibility for each patient undergoing surgery, and it is only by efficient team work that the optimum results can be obtained.

The manifestations of shock as related to anesthesiology encountered in the most forward installations equipped for major surgery will be considered here. Only emergency surgery on nontransportable casualties was performed in these forward installations. About 80 percent of these patients were in profound shock on admission, with a systolic blood pressure of 50 mm. of Hg. or less, a rapid, thready, or almost imperceptible pulse, generalized vasoconstriction, cold and moist body surfaces, shallow, grunting respirations; often they were semiconscious. Trauma which was invariably the cause of the hemorrhage was often associated with peritonitis, gas gangrene, blast injury, and cerebral damage. On admission, they were promptly given oxygen, plasma, and citrated whole blood obtained from volunteer donors. If dehydration was present, 5 percent glucose in physiological saline solution was given after the blood pressure was stabilized within about normal limits. If the injury permitted, they were placed in the shock position and carefully covered with blankets. External heat was not applied. Early in our work we followed the observations noted while working with the members of the British R.A.M.C. and used a ratio of two units of plasma to each



500 cc. of citrated whole blood.\* More recently this ratio has been reduced to one unit of plasma for each 500 cc. of blood.

We were unable clinically to establish a precise criterion for operability of any patient who was or had been in profound shock. However, it seemed that a patient with a sustained blood pressure of about 100 mg. of Hg. and a radial pulse rate of 120 per minute or below was a good operative risk. The average time required to reach this goal through resuscitation measures was two and one-half hours. For those who failed to make a satisfactory response during the suggested regimen it was often deemed necessary to operate despite the great risk. During the course of the operation plasma or whole blood or both was constantly administered.

It was seldom necessary in the most forward hospital units to give additional morphine as these patients usually had received  $\frac{1}{2}$  grain or more before admission. The shocked patient absorbs morphine slowly until the circulation begins to approach normal, at which time the cumulative effect of repeated doses is often rapidly attained along with marked depression of respiration. This untoward effect complicates the anesthetic procedure. For patients requiring additional morphine, dosages of  $\frac{1}{4}$  grain are maximal but seldom required preoperatively in "first priority" surgical cases. The desired balance between morphine and scopolamine could seldom be secured in the nontransportable casualties. Scopolamine was used preoperatively to stimulate metabolism and respirations, to aid in lessening bronchial secretion, and to produce amnesia. Atropine sulfate (grains  $\frac{1}{100}$ ) was used when amnesia was not particularly desired.

The range of selection of the anesthetic agent is more restricted than in civilian practice. However, except for cyclopropane and ethylene, the standard agents—ether, nitrous oxide, oxygen, sodium pentothal, spinal and local agents—are available in forward installations. Inhalation nitrous oxide was adequate for the induction of ether anesthesia, using a mixture of 70 percent nitrous oxide and 30 percent oxygen. The patients in shock approximated the metabolic rate of elderly individuals and we did not strive for first plane surgical anesthesia with ether but only for a relative analgesia. This procedure was used in 56.8 percent of all cases and was found to be satisfactory. Surgical anesthesia was continued under ether—oxygen mixture with a soda-lime cannister for carbon dioxide absorption introduced into the circuit. During induction neither anoxia nor prodromal symptoms of shock were noted. The observation that cyanosis is slow to appear in the anemic patient was given consideration. Chart 1 shows the different anesthetic agents that were used in the various types of battle casualties treated surgically.

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\*One British plasma unit consists of 500 cc. of wet plasma.

CHART 1

*Anesthetic agents employed in various types of battle casualties*

Anesthetic agent	Burns	Compound fractures	Soft tissue injuries	Traumatic amputations	Laparotomy	Thoracotomy	Head and neck wounds	Total
Sodium pentothal	15	8	130	0	0	0	0	153
N <sub>2</sub> O and O <sub>2</sub> Ether	34	34	152	10	6	0	0	236
Ether open mask	0	10	0	8	9	0	0	27
Local infiltration	0	1	12	0	0	0	3	16
Inhalation and local combined	0	0	3	0	12	0	0	15
Intratracheal N <sub>2</sub> O and O <sub>2</sub> Ether	0	0	0	0	25	10	2	37
Intratracheal pentothal ether	0	0	0	0	5	5	7	17
Spinal	0	0	0	0	3	0	0	3
Total cases	49	53	297	18	60	15	12	504

The most difficult anesthetic problems were concerned with intra-abdominal and intrathoracic injuries. The time lag from initial injury to admission to the hospital for "first priority" surgery averaged seven and one-half hours. Shock was almost invariably profound and intratracheal nitrous oxide-oxygen-ether inhalation anesthesia was the anesthetic procedure of choice. Both orotracheal and nasotracheal routes were used for introducing the intratracheal catheter. These patients best withstood anesthesia if carried in the lower first plane or upper second plane of the third stage of anesthesia. The severity of shock increased as the time and depth of anesthesia below the upper second plane of surgical anesthesia increased. Occasionally the relaxation produced by nitrous oxide-oxygen-ether anesthesia at this plane was inadequate without additional block of the lower six intercostal nerves in the midaxillary line or infiltration of the sheath of the rectus muscle with novocain. In five patients with intra-abdominal injuries, sodium pentothal was used for induction and placement of the intratracheal catheter. These patients were restless and non-cooperative, refusing to allow the application of

face mask. Four cubic centimeters of 5 percent solution of sodium pentothal were injected intravenously and after full effect was obtained an additional 6 cc. of the same concentration were administered slowly. This use of sodium pentothal proved inadvisable because the phenomena of profound shock reappeared even in the presence of an adequate oxygen supply and the administration of continuous infusions of citrated whole blood. Spinal anesthesia was used in only three patients who were seen three days after injury and had been tentatively diagnosed as "blast injury" and exploratory laparotomy was deemed advisable. The course of the anesthesia was uneventful. In nine patients, open mask drop ether inhalation anesthesia was used as a necessity rather than by choice in the early hours of an initial beachhead landing operation. Nitrous oxide-oxygen-ether anesthesia was administered in six intra-abdominal cases complicated by intrapelvic injuries which involved the large bowel and/or urinary bladder and in which colostomy and/or cystotomy was required.

Intrathoracic injuries presented anesthetic problems similar to those encountered in intra-abdominal injuries. This group included sucking wounds, uncontrolled hemorrhage from the lung or chest wall, retained foreign bodies, extensive lacerations of lung tissue complicated by blast injury, and perforation of the diaphragm or combinations of these injuries. In five patients sodium pentothal (2½ percent solution) was used as the induction agent for the intratracheal catheterization. The same deleterious effects of the drug were noted as described in its use with intra-abdominal injuries and we believe the choice of this agent was unwise. In ten patients, nitrous oxide-oxygen-ether inhalation anesthesia was used. Controlled respiration and positive pressure were utilized to facilitate the operative procedure and make possible the re-expansion of the collapsed lung.

Patients with maxillofacial and neck injuries with loss of tissue about the face are difficult to anesthetize. When first seen they exhibit varying degrees of anoxia, are restless, and have an aura of impending death. They did not exhibit the advanced degree of shock seen in intra-abdominal and intrathoracic injuries. In seven such cases, sodium pentothal (5 percent solution) was used for induction of anesthesia and for insertion of the intratracheal catheter. In this type of case one may be justified in using sodium pentothal since intubation is anticipated and the facilities for tracheotomy are at hand. If needed, the airway can be quickly inserted and aspiration of tracheobronchial secretions accomplished. This procedure was carried out with realization of the hazards of using this anesthetic agent in injuries of this type. However, it was discontinued before the surgeon started operative manipulations. The drug should not be used unless intubation is intended and a tracheotomy set is in readiness. Anesthesia was continued under oxygen-ether, and careful observation

and supervision were exercised after extubation. Three cases in this group were done under local field infiltration anesthesia because the injury involved only the neck, and the removal of a foreign body and inspection for anticipated injury to the nerve supply of the larynx was all that was required. In two such cases nitrous oxide-oxygen-ether inhalation anesthesia with intratracheal catheterization was used since there was more extensive involvement of the structures of the neck and the duration of the operative procedure was necessarily prolonged.

Sodium pentothal ( $2\frac{1}{2}$  percent solution) was used alone in 153 cases which included burns, compound fractures, and soft tissue injuries. None of these cases was in shock when received, usually twenty-four to seventy-two hours after initial injury, and the duration of the operative procedure was short. No more than 1 gram of the drug was given to any one patient. In this group 0.37 percent developed nausea, vomiting, hiccup, coughing, laryngospasm, and respiratory depression during or following anesthesia. Careful preoperative medication was administered and food was withheld prior to the operative procedure. The burn cases in which the drug was used varied in degree but presented relatively small areas of tissue damage. The soft tissue injuries required only débridement or excision and sulfonamide petrolatum gauze dressing. Therefore, only light anesthesia for a short period was required and sodium pentothal was usually a suitable anesthetic. In injuries of this character, frequency of administration equaled that of nitrous oxide-oxygen-ether. The compound fractures in this series were of the lower arm and foot requiring no different anesthesia than did the soft tissue injuries.

In this series were 236 patients in whom nitrous oxide-oxygen-ether inhalation anesthesia was used. Inhalation anesthesia was selected because the surgical procedure was necessarily of rather long duration. Many of these patients could have been anesthetized by inhalation of open-drop ether but there are certain advantages in using the closed anesthetic apparatus, among which are conservation of body heat and moisture as well as offering a high concentration of oxygen.

Brachial plexus block anesthesia was used in twelve cases. Two percent procaine hydrochloride solution with adrenalin (1:200,000) injected according to the accepted techniques proved entirely satisfactory. Cases in this series consisted of a partial traumatic amputation of the hand, ablation of the ulnar or radial nerve, compound fracture of the forearm complicated by a chest injury which was being treated conservatively, ligation of arteries in the forearm, and severe lacerations of the extensor tendons of a hand. Brachial plexus block is particularly suitable in this category of patients where most of the surgical procedures are long and voluntary cooperation of the patients is desired. Some of these patients were deemed to be poor risks for inhalation anesthesia and this procedure proved to be a valuable asset.

## CONCLUSIONS

1. The patient in shock constitutes a major problem in anesthesia, before, during, and after surgery.
2. Inhalation anesthesia with and without the use of intratracheal catheter should be as light as is compatible with the requirement of the surgeon.
3. Spinal anesthesia in the front-line echelons is rarely indicated.
4. Local and regional block in selected cases proved to be a valuable adjunct to our armamentarium.
5. Anesthesia for war casualties presents many difficulties and should be conducted by well-trained and experienced anesthetists.

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## Cutaneous Leishmaniasis

MAJOR DAVID BALL

Medical Corps, Army of the United States  
and

CAPTAIN RAYMOND C. RYAN

Medical Corps, Army of the United States

This report is based on 499 proved cases of cutaneous leishmaniasis in American forces in the Middle East. Cutaneous leishmaniasis is a granulomatous, ulcerative lesion caused by a protozoan parasite, *Leishmania tropica*. The disease is endemic in India, Persia, Africa, Iraq, Palestine, countries bordering the Mediterranean Sea, southern Russia, and in Peru and Brazil. *Leishmania tropica* is identical morphologically and culturally with the *Leishmania donovani*, the causative agent of kala-azar.

Leishman and Donovan, working independently in different parts of India, described in 1903 the parasite causing kala-azar. At the same time that Donovan made his discovery, Wright found *Leishmania tropica* in tissue excised from an oriental sore in an Armenian patient at Massachusetts General Hospital. Both cutaneous leishmaniasis and kala-azar are never found in the same locality. Where one disease exists, the other does not. Workers have never been able to explain this phenomenon.

Dogs in Persia and Algeria are naturally infected with *Leishmania tropica*. Hamsters, white mice, squirrels, and dogs can be infected with the organism. The sandfly (*Phlebotomus*) is the probable vector. The common housefly can carry the parasite and may directly infect open wounds.

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Captain Joseph H. Eisner and Captain Frank Kolos made the laboratory diagnoses possible; Captain Paul S. Friedman treated the x-ray group; Technician Third Grade Gus J. Lazares, Cpl. Alfred S. Condhino, and Technician Fifth Grade Orville Frodge, Jr., worked untiringly in the clinic.

The disease is limited to the skin and never causes any constitutional symptoms or general dissemination. The lesions are commonly found on the exposed surfaces such as the face and arms. Our soldier commonly sleeps naked during the summer with his face, elbows, knees, or feet touching the net, thus exposing these parts to insect bites. One soldier developed four lesions on his left foot, toward the end of a three months' hospital stay. He was in the habit of sticking his left foot against the net. Many nets are not kept down during the day, are carelessly tucked in at night, and are not sprayed before retiring. The incubation period is said to vary from a few weeks to several months. In our series, one case had an incubation period of about ten days and a few cases of about six weeks.

The early lesion resembles an indolent insect bite. In the beginning it may or may not itch. It is painless, begins as a small red papule, and gradually enlarges. The center forms a thin crust and becomes slightly dimpled. Ulceration occurs in the center and forms a thick, rough crust or scab which is difficult to remove. At this stage there is a raised, red, firm, liplike edge around the ulcer. The lesion grows as large as 1 to 1½ inches in diameter, averaging about ¾ inch. We found that a positive diagnosis is best made from smears of scrapings under the edge of the crust. In untreated cases, spontaneous healing begins after three months to one year, leaving depressed, disfiguring scars resembling old-fashioned vaccination scars. *Salek*, meaning a year, is the Persian name for this disease.

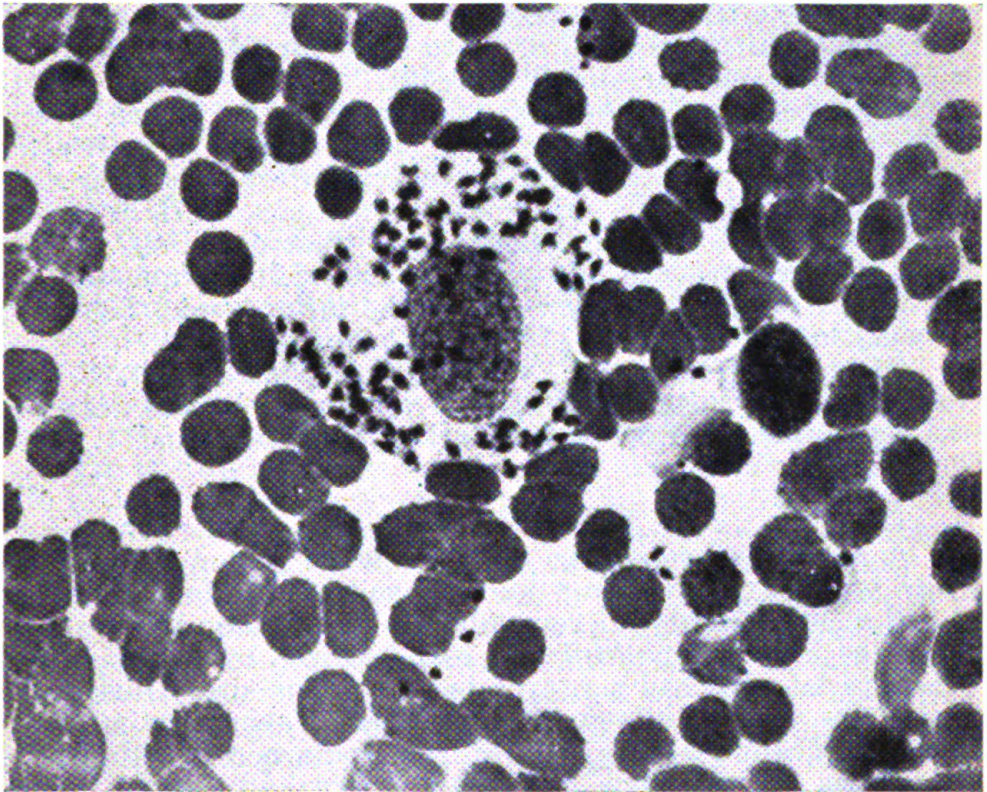
In October 1943, a soldier with an indolent ulcer on his forehead was referred to the hospital with a diagnosis of cutaneous leishmaniasis. The referring medical officer, who was born in an endemic region had the disease as a boy and was thoroughly familiar with it. Scrapings from the lesion revealed *Leishmania tropica*. Two more cases were diagnosed in a short time. When these three cases were discussed at a staff conference, the entire staff became "leishmaniasis conscious." About this time, soldiers were being referred to the outpatient department for physical examination for the purpose of deleting the term "limited service" from their service records. One day three out of six soldiers were noted to have lesions that suggested cutaneous leishmaniasis, and scrapings were positive in all three cases. The same event occurred in six soldiers a few days later, making twelve proved cases. A conference with the district surgeon resulted in the adoption of a definite program. A letter was sent to each dispensary, describing the lesion and directing that all suspicious cases be referred to the general hospital. A special leishmaniasis clinic was set up, and 47 proved cases were admitted the first week. To date, 499 proved cases have been admitted for treatment. Because of transfers and changes of station, 102 cases were dropped, leaving 397 for continued observation and treatment.



The treatment used was based on current Army directives, listing the following accepted methods:

1. Local treatment consisting of topical application of dry ice.
2. Local injection of 2 cc. of 1 percent solution of berberine sulfate into the edges of the sores.
3. Intravenous injection of neostam or neostibosan, using the same dosage as for visceral leishmaniasis (kala-azar), i.e., 15 doses on alternate days, the first dose 0.2 gram and subsequent doses of 0.3 gram.
4. Superficial x-ray therapy.

It was decided that individuals with three or fewer lesions would be treated by local methods, and those with four or more would be given intravenous therapy. However, it soon became apparent that each case had to be appraised individually. Many persons with a single lesion had to be treated intravenously



*Leishmania tropica*. Smear of scrapings from skin lesion. Army Medical Museum photograph No. 67763.

because of size of lesion, location of lesion, or presence of secondary infection. All patients with many sores were, of course, treated intravenously. As dry ice or CO<sub>2</sub> snow pencils were not available, ethyl chloride spray was used on one group of cases. Neostibosan was not available; therefore, neostam was used as the intravenous agent. A series was treated with superficial x-ray therapy. A few lesions were excised surgically to obtain specimens for study. Berberine sulfate was available for local use.

Every person applying to the clinic was interviewed by a trained corpsman and a complete history was taken. The patient then stripped and was observed by a medical officer who indicated the location of lesions by circling the proper region on a form containing simplified drawings of the body. Treatment, progress, laboratory data, and other pertinent data were recorded. The highest percentage of positive scrapings was obtained from the smaller, younger sores. The parasites are usually found in the granulation tissue at the base of the lesion. Any crust present on top of the papule was scraped away with a sterile, sharp scalpel; granulation tissue at the edge of the sore was removed with the tip of the blade and spread over a glass slide. Two slides were prepared for each case and only one stained by the Giemsa method. If found positive, the second slide was discarded; if negative, the second slide was stained and examined. If a case was reported negative, it was referred back to the laboratory a second or third time for rescraping of the same sore or another sore if present. After scraping, a little sulfanilamide powder was dusted on the lesion and it was covered with a small square of sterile gauze. This has proved most effective in preventing secondary infections, often resulting after disturbance of the heavy crust covering the sores. All of the 499 cases had a positive scraping and were treated. Of the positive group 102 were transferred to other parts of the command, leaving 397 to complete treatment. Of the latter group 380 (95.7 percent) have been cured; 17 are still under treatment.

Of the 397 cases, 343 were white enlisted men; 8 were colored enlisted men; 28 were male officers; 16 were nurses; 1 was an American Red Cross worker (female); and 1 was a Polish female civilian.

#### INCUBATION PERIOD

A method to determine the incubation period in a clinical study of this type was not known; however, a few cases furnished a clue. An officer remembered having been bitten on the neck; the bite was painful and was followed by a local wheal. Ten days later he had a proved lesion in this site. During this study, new troops arrived. They had spent about one month in India and about ten days coming from India here. Within three days after arrival some of these soldiers had proved lesions. Their maximum incubation period would be about six weeks. It is assumed that these soldiers were infected in India.

The lesions were known to exist a minimum period of one week, a maximum of 22 weeks, with an average of 9.7 weeks before treatment was started. A total of 1,769 lesions was observed. The minimum number of lesions was one, maximum 29, with an average of 4.3 lesions per individual; 204 individuals had up to three lesions and the remaining 193 had 4 to 29 lesions.

Some of the unusual locations of lesions were the face, ears, neck, elbows, fingers, knees, ankles, foot and toes, and penis. The penile lesions had repeated negative darkfield examinations and



serologic tests for syphilis. Smears were positive for *Leishmania tropica* on the first examination in 387 cases; 2 smears were necessary in 9 cases; and 3 smears, in 1 case.

#### TREATMENT

*Neostam intravenously.* Neostam is recommended in S.G.O. Circular Letter No. 33, 2 February 1943, to be given intravenously, fifteen doses on alternate days, the first dose 0.2 gm. and subsequent doses 0.3 gm., a total dose of 4.4 gm. in every treated case. In view of the known toxicity of antimony and the fact that the disease is nonfatal, we thought it wise to give a smaller dose.

Injections were given twice a week instead of every other day, mainly because of the large number of cases being treated and the limited number of syringes at our disposal. Soldiers receiving neostam were divided into three groups and each group was treated twice a week. The first injection given was 0.05 gm., the next injection 0.1 gm., the third 0.15 gm., and the fourth and all succeeding ones, 0.2 gm. In a few individuals who had frequent untoward reactions, the maximum dosage was kept at 0.15 gm. The average individual received 1.14 gm. of neostam. The lowered dosage and less frequent injections probably account for the length of time before cure was attained in this group.

The neostam on hand was completely used up by 22 November 1943 and no more was available until 20 December 1943. All cases then under treatment (27) were carefully observed once a week. At the end of the "one month no treatment period," an interesting observation was made. Those who had already received five injections (a total of 0.7 gm) showed definite evidence of healing of the lesions. This made us feel that it was safe to continue to use the lowered dosage with injections twice a week. We were treating 50 or 60 persons each day. Individuals receiving neostam intravenously were made to lie down for two to three hours. Toxic reactions which usually appeared in from forty-five to ninety minutes after an injection consisted of mild nausea, severe projectile vomiting, diarrhea, and, in three cases, collapse. Reactions were quickly abated by giving the patient morphine, 0.011 gm., hypodermically. In the beginning, reactions ran as high as 5 percent. All injections were given slowly. Reactions occurred with the smallest as well as the largest doses but more frequently with the larger doses. Dissolving the neostam in sterile water, normal saline, or 5 percent glucose did not affect the percentage of reactions. It was then decided to reduce the maximum dosage to 0.15 gm. and give the injection at noon, having the soldier omit the noon meal. An immediate reduction occurred in reactions to 0.83 percent in the last 950 injections. The unpleasant taste following the injection of neostam can be prevented by chewing gum. Blood counts and urinalysis were done on cases with severe reactions and were all normal except one case which exhibited a transitory albuminuria; 221 cases were treated with neostam intravenously, of which number

207 were cured and 14 remained under treatment. Of the 221 cases, 155 started initial treatment with neostam intravenously; 13 cases were originally treated with ethyl chloride spray and then changed to neostam intravenously; 31 cases were originally treated with berberine sulfate locally and changed to neostam intravenously; 2 cases were originally treated with berberine sulfate locally, then changed to neostam locally, and finally to neostam intravenously; 13 cases were originally treated with ethyl chloride spray, then berberine sulfate locally, and finally neostam intravenously; 5 cases were originally treated with neostam locally and were changed to neostam intravenously; and 2 cases, treated with x-ray, were finally treated with neostam intravenously. These cases, originally given the local form of therapy and then changed to neostam intravenously, had a change in therapy because of absence of cure or evidence of healing after a sufficient period of observation of local therapy. In the cured group, the minimum time for cure was 2 weeks, maximum 20 weeks, an average of 14.5 weeks. There were no failures.

*Berberine sulfate locally.* S.G.O. Circular Letter No. 33, 2 February 1943, states that local therapy may be tried first in the form of 2 cc. of a 1 percent solution of berberine sulfate injected into the edges of the sores. It was found that berberine was best injected using a Luer-Lok syringe. The average lesion was completely infiltrated with 1 cc. of the freshly prepared solution. Injections were given on the average of once a week; 138 cases were originally started on berberine therapy; 44 cases that failed to respond to ethyl chloride spray therapy were transferred to this group; 97 of the original group were cured in an average of 6.8 weeks; 27 cases that failed to show evidence of healing after an average of 3.2 weeks' treatment with ethyl chloride were cured with berberine sulfate in an average of 4.5 weeks; 58 cases of the berberine group that failed to show evidence of any healing in an average of 5.5 weeks were transferred to neostam locally or neostam intravenously; this represents 31.8 percent failure of response to treatment.

*Ethyl chloride spray.* As carbon dioxide snow pencils or ice were unobtainable, it was felt that freezing the lesion with ethyl chloride spray would simulate the effect of carbon dioxide; 65 cases with one to four early, small, noninfected lesions each were thus treated. Treatment was repeated every five days. Eight cases were cured in an average of 5.5 weeks; 57 cases in this group showed no evidence of healing in an average of 3 weeks and were changed to other forms of therapy. Only the very small and relatively early lesions were amenable to this form of therapy. This represents 87.7 percent failure of response to treatment.

*X-ray therapy.* Fifteen cases with 28 lesions were referred for x-ray treatment. To evaluate this form of therapy, two cultures of *Leishmania tropica* were prepared in the laboratory; one was irradiated with the same technique as the lesions and the other was not. Both cultures continued to grow, indicating

that x-rays in the dosage used did not kill *Leishmania tropica* in vitro. Only cases with one to four small, noninfected, early lesions were chosen for this study. The routine consisted of four treatments of each lesion every four days, initial dose 60 r. and each succeeding dose 75 r., making a total of 285 r. at 90 Kv. with a 1-mm. aluminum filter. One case received 300 r. Four cases were transferred to other parts of the command before follow-up studies could be made and one patient was switched to neostam by vein because he was leaving the command. Another patient failed to respond and showed evidence of extension and ulceration seven weeks after treatment was completed; he was then started on neostam intravenously. This was the only failure in this group. The remaining 9 cases were cured on an average of 8.3 weeks after the last x-ray treatment was given.

*Neostam locally.* In view of the large number of failures (31.8 percent) in the berberine group and the good results in cases treated with neostam intravenously, it was decided to treat a group with 2 percent neostam locally, with the technique used for berberine sulfate. Of 35 cases so treated, 24 were originally started on this therapy and 11 had failed to respond to berberine and/or ethyl chloride after an average of 4.5 weeks; 3 cases failed to respond to neostam locally after an average of 6.3 weeks; 3 cases are still under treatment, 2.5 to 4 weeks; 32 cases were cured in an average of 3.3 weeks, the shortest interval for cure of any group.

#### COMPLICATIONS

Twenty-seven patients (0.7 percent of proved cases) were hospitalized because of secondary infections in the extremities or back. Most of the lower extremity lesions were situated on or near the ankles where the sores were rubbed by the shoes. There were 18 cases of localized cellulitis, 3 cases of cellulitis and lymphangitis, 1 case of thrombophlebitis, and 1 case of thrombophlebitis and cellulitis; 10 cases of this group started treatment with berberine sulfate locally, which may have contributed to the development of secondary infection; 12 cases were being treated with neostam intravenously, and the remaining 5 had the infection before any treatment was started. The number of hospital days for this group was 704, minimum number of hospital days 5, maximum number 93 (1 case), with an average of 25 days. Treatment consisted of bed rest and wet dressings applied to the infected area. It was found that the continuation of the intravenous neostam therapy hastened healing. If the patient had been receiving berberine sulfate locally, this was discontinued and he was given neostam intravenously.

#### UNTREATED GROUP

As previously stated, only proved cases were treated; 134 patients applying to the clinic had two or three negative smears. Of this group, we were able to follow up 69 patients. Sixteen

of this group were not considered clinically to have the disease, leaving 53 cases of clinical cutaneous leishmaniasis with negative smears. Four of these patients still have the disease in an active form after 16, 18, 19, and 20 weeks, respectively. The remaining 49 cases healed spontaneously possibly in an average time of 7.3 weeks. The fact that all of these cases had two or three negative smears suggests they were in the healing stage when first seen.

#### CRITERIA FOR CURE

As healing takes place, the color of the "red zone" surrounding the lesion diminishes and gradually is replaced by a copper-colored pigmented zone. Next, the crust falls off, revealing a pigmented, slightly depressed area covered with new epithelium. The pigmentation has become less marked in cases observed up to the present and will possibly disappear entirely. Several cases have lost the pigmentation completely. There are no visible scars in some cases where formerly large sores were present. In a few colored soldiers, it was noted that, on healing, the sore was replaced by a depigmented scar. One of us on a recent trip to Baghdad saw many healed lesions of cutaneous leishmaniasis, treated and untreated. Most of the individuals had large, deforming, vaccination-type scars on the face and legs. None of the cases in our series exhibited such scars.

#### RECURRENCE

Only one cured case has developed a reinfection or recurrence. This soldier with three lesions on the left arm was treated with berberine sulfate locally and cured after two injections. A follow-up one and two months later revealed three fresh sores adjacent to two of the healed lesions and one lesion over the symphysis pubis. Scrapings from the arm lesions were positive and those from the pubic lesions negative. It is impossible to state whether these are new lesions or relighting of supposedly cured lesions. An attack of cutaneous leishmaniasis is supposed to give immunity for life. Whether or not cure by treatment offers the same immunity is not known.

#### PROPHYLAXIS

Meticulous use of the sandfly net, headnet, and insecticides in known endemic areas will reduce the incidence of cutaneous leishmaniasis. Expeditions under the leadership of Professor Pavlofsky were engaged during 1937 and 1939 in a search for hosts acting as reservoirs of human cutaneous leishmaniasis and breeding places of the sandfly vector in Turkmenistan and Middle Asia. Microscopic examination of a large number of local animals revealed that 60 percent of the commonest representatives of the desert fauna (gerbils and *Rhombomys opimus*) were naturally infected with *Leishmania tropica*. The identity of the gerbil and human parasites was established by infection of the rodent with material from human sores (100 percent positive) and by experimental transmission of the infection from gerbil to man. Thirty-five percent of the sandflies captured "in the

burrows" were infected with the leptomonad form of *Leishmania*. In one settlement, the destruction of rodents in their burrows with chloropicrin was followed by a decrease in the incidence of human infection from 70 percent to 0.4 percent.

#### CONCLUSIONS

1. Neostam intravenously is a safe drug to use in the treatment of cutaneous leishmaniasis. In this study the average cured case received 1.14 gm. of neostam and injections were given twice a week. This was probably too conservative. It is suggested that the same dosage described be used, but that injections be given three times a week.

2. Toxic reactions following neostam intravenous injections can be almost completely abolished by having the individual abstain from food for about five hours before receiving an injection.

3. Only noninfected lesions in accessible regions should be treated by local methods. Any lesion with the slightest evidence of secondary infection must be treated with an intravenous drug.

4. Neostam (2 percent solution) locally is effective in the treatment of this condition. The shortest "cure interval" (3.3 weeks) was obtained with this drug.

5. Berberine sulfate locally in our experience is a relatively ineffective drug.

6. Ethyl chloride spray is ineffective in treating cutaneous leishmaniasis. It cures only very early, small lesions.

7. The results obtained with superficial x-ray therapy in a small group of cases suggests this is effective in selected cases.

8. Only 0.7 percent of the group had, or developed, a complicating secondary infection.

9. Only one case developed a reinfection or recurrence of cutaneous leishmaniasis during this period of study.



Tent around surgical truck provides for three surgical teams, one working in the truck and one on each side of the truck in the tent (North Africa). Signal Corps photograph.

# Oral Rehabilitation

## Case Report

CAPTAIN R. C. REICHERT

Dental Corps, Army of the United States

Conservation of manpower through rehabilitation is greatly stressed in the war effort. Dental science has opportunities to salvage Class I dental patients that on initial examination appear to be beyond assistance. Often routine examination uncovers a case with possibilities for rehabilitation of a soldier who through his dental deficiency is unfit for active field duty. Dental cripples have passed through induction stations and reception centers because hasty examinations failed to note a functional malocclusion and often such soldiers reach the final stages of training before their condition is brought to light by digestive difficulties. The dental officer is then faced with the military tragedy of recommending disability discharge of a fully trained man or of finding a solution to the problem through creative dentistry.

### CASE REPORT

A soldier, aged 21, was admitted for dental prosthesis because of inability to masticate food properly. He finished his meals long after his fellow soldiers, his diet was restricted to certain foods, and he resorted to cathartics routinely.

Oral examination revealed the presence of the following natural dentition, free from pathology: maxillary, L-1-3-4, R-1-3; mandibular, L-9-10-11-12, R-9-10-11-12. The upper lateral incisors were congenitally absent. An acromegalic condition was present with the characteristic hypertrophic mandibular arch and agenesis maxillary arch, in which absolutely no contact or occlusion existed between the arches in centric bite or any other position. This deformity was further complicated by a restriction of full closure due to contact of the ascending rami of the mandible with the maxillary tuberosities.



FIGURE 1. Lateral view of case in centric position.



## PROCEDURE

Extraction of the remaining maxillary natural teeth for a full artificial denture was considered inadvisable, because subsequent resorption of anterior ridge would accentuate the condition beyond hope of even a lingual under-bite occlusal set-up and because fulcrumage caused by setting teeth outside the ridge to establish an occlusion would break the posterior seal of an artificial denture, dislodging it and causing excessive resorption of the anterior ridge through trauma. It was decided therefore to con-



FIGURE 2. Prosthetic treatment of case on articulator.

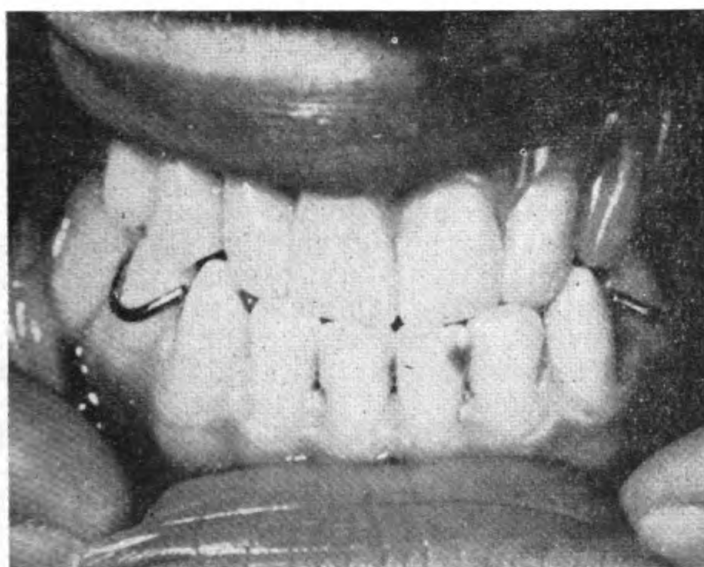


FIGURE 3. Frontal view of case after prosthetic treatment.

alginate impression material. The chief contraindication to this plan was the possibility of gingivitis or caries. To combat these threats rigid mouth and denture hygiene was necessary.

construct an ordinary lower lingual bar replacement to supplement the remaining mandibular dentition, and in occlusion with it, a full denture splint superimposed over the remaining natural maxillary teeth. The impression for the latter was of modeling compound relieved and lined with

## RESULT

Construction of the case gave gratifying results. A good peripheral seal ensured retention of the superimposed denture, and a balanced end-to-end bite occlusion lent stability. The soldier now enjoys normal mastication, improved digestion, and great esthetic improvement.

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## Herniated Nucleus Pulposus

### Improvement in Operative Technique

MAJOR ROBERT C. L. ROBERTSON

Medical Corps, Army of the United States  
and

CAPTAIN WILLIAM G. PEACHER

Medical Corps, Army of the United States

Following the completion of seventy-three operations on herniated nucleus pulposus performed by the technique described by Love, we found that there were numerous postoperative symptoms and signs that compromised the anticipated results. In this group there were seven that we felt needed re-exploration to explain the postoperative pain. These were done at various intervals following operation. In each case re-explored, dense adhesions were found which extended from the paraspinal muscles to the nerve root and dura. A number of these nerve roots showed actual constriction from surrounding scar tissue.

In the effort to obviate the development of such scar tissue, we initially began replacing the ligamentum flavum with a segment of tantalum foil (twenty-six cases) which was placed in the interval between the laminae and closely applied to the dura. Later we began preserving the ligamentum flavum (thirty cases) by leaving the lateral attachment intact rather than removing it completely. At the termination of the intraspinal portion of the procedure, the ligamentum flavum could then be swung back into its former position where almost invariably it completely replaced the interval between the laminae and required no fixation. In a few cases one suture has been used to maintain the ligamentum flavum in its former position.

Since this portion of our procedure was changed, fewer postoperative complaints have been noted. Ninety-seven percent have returned to duty; whereas, before the ligamentum flavum was replaced or tantalum foil substituted for it, 81 percent returned to duty. In the first group there were seventy-three cases, in the second group there were sixty-seven. No



other significant changes have been made in our operative procedure. This maneuver has improved our operative results not only with respect to postoperative complaints and residuals, but in the final capabilities of the soldier to perform duty.

Which of the two methods, namely, preservation of ligamentum flavum as such or replacement with tantalum foil, is the better cannot be stated at present, since we have had an opportunity to perform re-exploration in only one case. This was in a patient who had a segment of tantalum foil used to replace the ligamentum flavum and some scarring was noted between the muscles, dura, and nerve root. However, the foil was too superficial at the time of the secondary operation to have prevented the extension of scar tissue from the muscles to the intraspinal structures.

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## Surgical Problems in the Buna Campaign

COLONEL AUGUSTUS THORNDIKE

Medical Corps, Army of the United States

Before discussing the care of the sick and wounded in a tropical jungle, the historical and geographical factors of orientation probably should be described. The facts have been collected from War Department records and from direct contact with the casualties evacuated to a general hospital in Australia. The combat engagements in this campaign occupied the period from November 1942 to January 1943.

The rapid advance of the Japanese in the Pacific and Far East comprised three main episodes. The attacks on Pearl Harbor, the Philippines, Guam, and Wake Island culminated in the surrender of Corregidor by 6 May 1942 and in the loss of all American land forces and equipment in the Pacific as far East as Midway and Hawaii. The second phase of the Japanese conquest was the advance down the Chinese coast into Indo-China and Siam and down the Malayan Peninsula culminating in the surrender of Hongkong and finally Singapore on 15 February 1942. The third phase was the invasion of the Bismarck Archipelago, New Ireland, New Britain, and New Guinea. The Japanese were defeated in the Coral Sea by the naval forces of United States, Australia, and the Dutch on 11 May 1942, and within a month they suffered a second defeat at Midway Island. Undaunted they made a landing on Kiska in the Aleutians on 10 July 1942. Thus the momentous spread of Japanese military power over the entire Western Pacific took place in seven months from 7 December 1941.

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Read at a meeting of the Boston Surgical Society on 3 April 1944.

The South Pacific Theater was concerned with the Japanese landing in the Solomons in April and May 1942. These islands were attacked by our marines on Guadalcanal on 7 August 1942 and are now conquered except for a small area on Bougainville Island which is completely cut off from supply. The Japanese invasion of the Admiralties, New Ireland, New Britain, and New Guinea continued and enemy landings at Kavieng, Rabaul, Gasmata, Gona, Buna, Lae, Salamaua, and Wewak, between January and July 1942, were aided by the conquest of the entire Netherlands East Indies. The elements of our Navy operating under the Dutch were severely trounced in an important engagement in this area. The Australian Army during those same seven months consisted of three forces, the AIF, the AMF a militia and home-guard force, and the RAAF, without sufficient equipment and assigned largely to the African and European Theaters or in training.

All AIF infantry divisions were away in Libya, Syria and Palestine, Singapore, and Ceylon. On General MacArthur's assumption of command, 17 March 1942, the threat of invasion was real. Darwin had already been bombed on several occasions. Air Force elements on hand were at a minimum. Immediately, AIF units from one region were recalled, forces were dispatched from the United States, and by August, Air Force reinforcements had been assembled together with supplies, but not in adequate quantity to carry on offensive action. On 7 September 1942 the Japanese attempted an invasion at Milne Bay but were repulsed by the Australian AIF. However, at the same time, enemy forces had crossed the Owen Stanley Range from Gona reaching within twenty miles of Port Moresby on the 14th of September. The Japanese still dominated the air. A discouraging experience it was for our fighter pilots to be continuously outnumbered and those who were patients in the hospital expressed themselves freely.

Air strength increased and with the assignment of Lieutenant General Kenney with the Fifth Air Force a new chapter was written. On the 25th of September an American infantry unit was brought into Moresby eighteen days after the enemy closed in on this port. Much engineering was still required to prepare for an assault carrying to the north coast of New Guinea! Secretly, fighter air-strips were built on the north side of the Range and by the 28th of September a force of U. S. infantry was opening a trail over the Range to join the Australians coming up from Milne Bay to the east by boat and along trails of the north coast of New Guinea. These forces met and engaged the enemy on 2 November. In the meantime, another U. S. infantry unit had been flown across the range, thence by barges and small boats to Pongani. Australian troops to the west had forced the enemy to retreat across the range to Gona on the north coast by early November. The enemy was well fortified in an area of tropical jungle and swamps, holding thirty-six miles of coast line with control of

the air and sea, and with pillboxes and entrenchment at each of the five jungle tracks which penetrated in the north-south direction. November was a discouraging month; the terrain was difficult and the climate hot with much rain. Mold rotted shoes and other equipment, supply lines were difficult to maintain, and the operations were stalemated. After four weeks in combat our troops were fatigued and suffered from the rigors of jungle life.

Additional U. S. infantry troops were then flown from Moresby to Doboduru and Lieutenant General Eichelberger was ordered to command American and Allied troops in the Buna area. From then on, by slow and constant pressure this area was cleared of Japanese as a result of increasing air strength and artillery; without the latter, including a few tanks, and only when the Japanese artillery had been put out of action could our medical units operate in this advanced area. Lateral communications were such that it required two days for a runner to carry a message from one flank to another. By the 29th of January all action had ceased.

With this background, the medical military picture can be more clearly presented. The sick and wounded could not have been cared for had it not been for the portable surgical hospitals and the native litter carriers. The contribution of these units and of these individuals was extremely important. Brigadier General (then Colonel) Percy J. Carroll, Chief Surgeon, conceived the necessity for such units and in conference with the surgical service of our hospital advised us of the situation as early as June 1942. Our hospital was ordered to provide two portable hospital units for this campaign, each comprising four officers, three of whom were surgeons, and twenty-five enlisted men (medical, surgical and laboratory technicians, administrative clerks, mess attendants, etc.). Tentage and medical and subsistence supplies were provided. The objective was to have the unit packed so that with each man carrying, the entire hospital could be removed and relocated by its own personnel. Much bivouac practice was done in a tropical forest not far from the main hospital. These units were constantly experimenting until early October when they were alerted to move north with U. S. infantry reinforcements with which they remained until Sanananda Point was subdued and the regiment returned to the mainland of Australia. A good account of the experience of one of these hospitals was given by Major George A. Marks in the *Bulletin of the U. S. Army Medical Department*, December 1943. The portable surgical hospital actually operating within 500 yards of the infantry in combat, was the Medical Department's solution to the care and treatment of the sick and wounded. Brain, chest, abdominal, and extremity cases were all well treated by highly qualified medical officers within earshot of rifle fire; they were so near the lines that enemy patrols were found at night

within the hospital area. More than once they were strafed by planes flying at treetop level. It takes rugged personnel to perform essential duties in such a forward area! From the battle area the wounded were carried, by the regimental medical detachment, along existing jungle tracks directly to the portable hospital. Sodium pentothal was used for anesthesia in over 90 percent of the cases and skilled surgery was done there in as aseptic an environment as could be obtained in a tent operating room. The wards were pyramidal tents with canvas cots for beds. The patients remained twenty-four to forty-eight hours on the average before being evacuated to the rear by native litter carriers. Wounds were treated according to accepted methods, débridement with the use of sulfanilamide powder locally and sulfonamide medication internally, with drainage and immobilization mostly with plaster of paris. Occasionally resections were done; more often, closure of perforating wounds of the gastro-intestinal tract. The results in cases that were subsequently evacuated to our hospital were excellent. The compound gunshot fractures were in very good condition. I can recall only two cases that had to have amputations subsequently at our hospital.

Comment concerning these cases could be nothing but favorable of the manner in which surgical treatment had been administered. Good surgery, sulfa drugs, and plasma saved many lives. Anyone who knew at that time the difficulties of maintaining supply lines could see why the period of combat was prolonged. Now adequate supply is available in all combat areas and hospitals. Our hospital had only the best and it was a pleasure to see the combat soldier enjoy subsistence and good medical care in comfortable general hospital environment. About 70 percent of the wounds were of the extremities. The Japanese rifle is .25 caliber; but little artillery was used against us. Penetrating perforating wounds, which were the common type, all did well and healed rapidly. Nerve exploration and suture, whenever possible, were done at the earliest possible moment after arrival at this hospital. The chest wounds were through and through with complicating rib fracture and hemothorax, the latter for the most part uncomplicated by infection. Guillotine amputations arrived in good condition but might have had more traction on the stump before enclosure in plaster prior to transport. The compound gunshot fractures arrived in plaster, having been treated by the method advocated by Trueta, on the whole in excellent alignment and with minimal infection. These cases were subsequently put in Kirschner wire traction for no other reason than to maintain position and to start joint motion at the earliest possible date. For evacuation to the States, in the presence of some union, these were put in plaster just prior to transfer. Head injuries reaching this hospital were not numerous; shrapnel wounds from hand grenade or mortar were the more serious. Wounds involving the face at the level above the

mandible did not do well. Skull and brain wounds were seldom seen at our hospital. Of particular note was the experience with wounds of the soft parts secondarily sutured along the evacuation line—every one broke down.

In the line of evacuation, from the portable surgical hospital, the wounded were carried by native litter carriers to a field hospital and from thence flown through the gap in the Owen Stanley Range to Moresby, of course, at the convenience of the weather and of the enemy. Chest and head cases did not profit by this method of evacuation. In the hospitals at Moresby they received treatment and rest, in preparation for further evacuation to the general hospital by air or hospital ship, sometimes with another station hospital stop.

In conclusion, the release and tabulation of statistical data have not been permitted by the War Department and, until such time, one's personal experience is the sole source of material available. The phases of combat discussed took place more than a year ago in the Southwest Pacific and resulted in defeat of the enemy at Buna. The problems in treatment and evacuation were many in this campaign. The application of skilled surgery at or near the line of combat, litter carrying by native labor, and rapid air evacuation to a fixed hospital are the answer to the prayer of the soldier wounded in jungle combat. It was only by the superior quality of surgical care rendered in the portable surgical hospital that the sick and wounded arrived at this general hospital well treated.



Patient being evacuated to hospital on a South Pacific island.

# Vaccinia Occurring at Short Intervals

CAPTAIN CARL A. MINNING

Medical Corps, Army of the United States

Because of possible exposure to smallpox, 717 officers and enlisted men were vaccinated by the multiple pressure (acupuncture) method and were examined for results by a medical officer nine days later. Vaccination was done irrespective of the recency or results of previous similar procedures. All persons had been vaccinated at least once, some as many as six times, in the preceding three years. All personnel were inoculated with cowpox virus of the same lot number, bearing the same expiration date. No germicidal material was used on the skin. Only a tiny drop of virus was used on each person. Excess virus was not wiped off. No dressings were used. No secondary infections occurred. Results are given in table I.

When results of these vaccinations were recorded on the soldiers' immunization registers, it was noted that vaccinia had been induced twice in several men during the preceding fifteen months and the question of perma-

TABLE I

Reaction	Number	Percent
Immune	476	66.39
Vaccinoid	179	24.96
Vaccinia	62	8.65
Total	717	100.00

nence of immunity by transfer of cowpox became apparent.

A careful check was made of all men whose present results are considered. Only those whose lesions contained lymph on the ninth day are included in the 8.65 percent who developed vaccinia. Of these 62 cases, 20 men were found whose records showed vaccinia during the preceding fifteen months. These 20 men were interviewed and examined again on the sixteenth day after vaccination. Nineteen of the 20 men had scabs from five to eight millimeters in diameter still in place. The other man had lost his scab that day and had a clean pink scar. Twelve soldiers remembered specifically the lesions which had followed the previous vaccinations, were able to point without hesitation to the resultant scars which looked as if they were about the proper age, and usually stated the date and severity of the reaction without questioning. Some said they were more sick with

the present and some said they were more sick with the previous vaccinia, but all agreed that they were quite ill both times. Table II gives the number of months between the attacks of induced vaccinia in these twelve cases. Eight men were unable to point out the scars from the vaccinations the results of which had been recorded as vaccinia. Some of the eight may have had quite severe vaccinoid reactions.

TABLE II

Months elapsing between attacks of artificially induced vaccinia	Number of cases
10	1
11	5
12	3
13	2
14	0
15	1

## COMMENT

In a random group vaccinated with cowpox virus, 12 men (1.67 percent) who had experienced the same disease from ten to fifteen months previously developed vaccinia. These people in all probability developed only transient immunity to smallpox through the first attack of vaccinia. If the spread of smallpox is to be prevented, in addition to periodic vaccinations, there should be routine inoculation with cowpox virus of all persons exposed directly or indirectly, irrespective of recency or results of previous vaccinations. The policy of the United States Army in this respect is affirmed.\*

\*Editorial note.—Current U. S. Army policy with respect to smallpox vaccination is stated in section III, AR 40-210, 15 September 1942, and in S.G.O. Circular Letter No. 162, "Immunization," 28 November 1942. These regulations require vaccination against smallpox as soon as possible on entry into the military service with revaccination at intervals of three years thereafter. In addition, revaccination is to be accomplished before departure for overseas duty unless the individual has been vaccinated within the twelve-months period prior to departure. Also, revaccination is required on exposure to smallpox or in the presence of an outbreak, regardless of date or result of the last vaccination.



First-aid station in Alaska, 1942. Signal Corps photograph.



# Inspection of Fish of the Pacific Northwest

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Veterinary Corps, Army of the United States

The inspection of fresh and frozen fish frequently is an important part of an Army veterinarian's duties in the Pacific Northwest. The veterinary inspector is concerned with distinguishing the species of fish and the relative commercial values of the various species. Condition with reference to the fresh and frozen state is of primary interest. Because of difficulty in differentiating between the species by means of conformation, color, and size, more scientific means of identification are used. The Federal Specification PP-F-381b, "Fish; Frozen" or "Fish; Fresh," is designated in the majority of Army invitations for bids to fish vendors. In addition, halibut should be specified as to weight, whereas the king salmon should be specified as to color of flesh. Owing to the lack of a uniform grading system, the grade in all species of fish should be of best quality.

## SALMON

Troller-caught salmon constitute the bulk of salmon sold on the fresh and frozen markets. The species caught by trollers are king (Chinook, spring, tyee, quinnat) and silver (coho) salmon; the other species of salmon, chum (keta, dog, calico), sockeye (reds, bluebacks), and humpback (pinks) are not fished commercially by trollers as they seldom strike on lures, spoon, or herring. Some salmon, such as chum and silver, are purse-seined in the fall season and sold fresh and frozen. However, purse-seining is not the best method of catch from a marketable standpoint. Other methods of catch used in fishing salmon commercially are fish traps (pile and floating), gill net (floater net and sinker net), beach seine, fish wheel, reef net, and dip net. All of these methods are utilized in the canned salmon industry.

### King Salmon

This is the largest species of salmon and is known in Alaska as king salmon, in Canada as spring salmon, and in the Columbia River as Chinook salmon. The average weight is 24 pounds, and some weigh as much as 100 pounds. Those of 14 pounds and over are used in the mild-cured industry;



whereas, salmon under this weight go to the fresh and frozen market and the canned salmon industry. This fish is caught by trollers and all other commercial fishing methods mentioned above.

Description: 1 Anal rays, 15-17. Gillrakers, upper, 7-9; lower, 11-13. Scales largest of the species of salmon. Vertebrae, largest of the Salmonidae family. Color, silvery, with round black spots on caudal and dorsal fins. Black spots also found dorsal to the lateral line and more numerous towards the dorsal line. Color of flesh varies from a creamy white to red. Texture of flesh, flakes of flesh are coarse-grained, more so than other species of salmon.

#### Silver Salmon (Coho)

The average weight of this species is 9 pounds. Fish which are 14 pounds and over are frequently mild-cured; those under this weight are used in the fresh and frozen market and in the canning industry:

Description: Anal rays, 13-15. Gillrakers, 19-28 (no average has yet been determined for upper and lower). Scales, large. Vertebrae—slightly smaller than those of king salmon. Color, silvery, merging into green on the back with faint black spots. Black spots on nape. Color of flesh, red. Caudal peduncle (anterior to caudal fin or tail), much thicker and broader than other species of salmon.

#### Humpback (Pink)

This is the smallest of the species of salmon, weight averaging 4 pounds, and it is the most numerous. This fish is not caught by trollers but is commercially fished by traps, purse-seine, gill nets, and beach seine, and is used almost exclusively in the canning industry.

Description: Anal rays, 14-16. Gillrakers, upper, 11-13; lower, 15-18. Scales, very small (smaller than on any other species of salmon). Vertebrae, small. Color, bluish in color with numerous black spots above the lateral line, silvery in color below the lateral line. A few large black spots on caudal and dorsal fins. Color of flesh, light pink. Texture of flesh, soft.

#### Sockeye Salmon (Red, Blueback)

This species, known in the Puget Sound as sockeye salmon, in Alaska as red salmon, and in the Columbia River as blueback salmon, averages about 7 pounds in weight. They are not caught by trollers but commercially by traps, gill net, purse-seine, and beach-seine methods, and are used chiefly in the salmon industry, rarely in fresh or frozen fish market.

Description: Anal rays, 14-15. Gillrakers (comparatively long and numerous), upper, 11-24; lower, 20-26. Scales, large. Vertebrae, small. Color, dark blue above the lateral line and silvery below. External appearance very similar to chum salmon. Color of flesh, very red. Texture of flesh, fine-grained and firm.

#### Chum Salmon (Keta, Dog, Calico)

This species of salmon is closely related in description to the sockeye salmon so far as size and external appearance are concerned. A great deal of experience is needed to differentiate between the two species. However, the sockeye salmon is primarily used in the canning industry and not usually offered on the fresh and frozen market; whereas, the chum salmon is utilized both in the canning industry and on the fresh and frozen fish market. This species is not caught by trollers but by traps, gill net, purse-seine, and beach seine.

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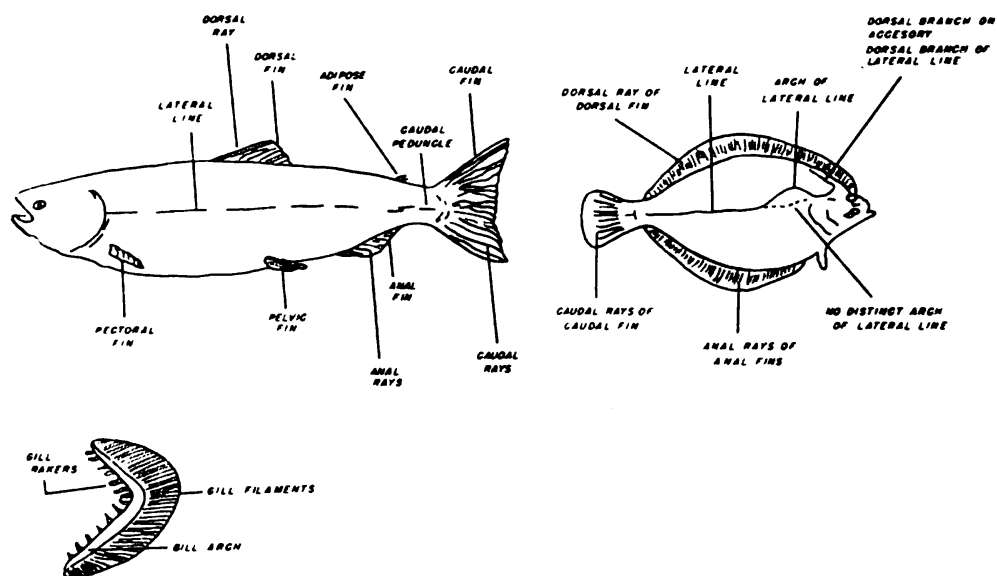
1. Schultz, Leonard P.: Keys to the Fishes of Washington, Oregon, and Closely Adjoining Regions, University of Washington Publications in Biology, Vol. 2, No. 4. Seattle: University of Washington, 1936.

Description: Anal rays, 13-15. Gillrakers, upper, 7-8; lower, 11-13. Scales, large. Vertebrae, large. Color, silver on the sides; sometimes sprinkled with small black specks and faint grid-like bars. Color of flesh, light pink to grayish white. Texture of flesh, rather firm.

### HANDLING AND STORING OF SALMON

Since the primary interest is the best quality in the grade of fish, troller-caught salmon will be discussed rather than those caught by other methods in which more bruising and consequent lowering of quality occurs.

Each troller carries sufficient ice for the proper icing of the catch. Fish are caught by hook and line, and are killed in the water before being brought aboard, to prevent bruising. They are then eviscerated, gills removed, abdominal cavity filled with ice and placed with heads lower, to insure proper drainage, in the hold of the boat. After a load has been



obtained, the fish are brought in port to a fish exchange where they are sold to the highest bidder. At the fish establishment, the fish are stored on the floor in sufficient ice to assure minimum deterioration.

If the fish are shipped out fresh, care is taken to prevent the loss of slime from the fish. Slime acts as a preservative agent, preventing rapid deterioration—more than if the slime were removed. Heads are left on to prevent exposure of flesh to contamination and bacterial invasion. If the fish are to be stored frozen, they are thoroughly washed, the heads are removed, graded, and brought to the sharp freezer, in which they are kept from twelve to fourteen hours or longer, varying

as to size, at a temperature of  $-30^{\circ}$ . From the sharp freezer, fish are immediately brought to the glazing tank where they receive a complete covering of ice. Fish are then brought to the storage rooms and stacked in rows with the napes (anterior part of the fish after heads are removed) all to the outside so they may frequently be examined for any loss of glaze. If the glaze is damaged, they are immediately sprayed with water which reglazes, minimizing any exposure to the atmosphere. The storage rooms are kept in a temperature range of from  $-10^{\circ}$  to  $0^{\circ}$  F. If fish are kept a length of time at higher temperatures, the oil oozes through the glaze and becomes oxidized, a condition known as rusting (brownish discoloration).

#### GRADING FACTORS IN THE INSPECTION OF SALMON

##### Fresh (Round)

1. The flesh of troller-caught salmon will have a bright "bloom."
2. Fresh transparent slime over body surface (dry milky appearance of slime indicates staleness).
3. Eyes should be clear without opacity.
4. Free from intestinal burns (ribs separated from flesh in the poke (abdominal cavity) due to intestines not being promptly removed and improper refrigeration).
5. Free from brownish discoloration in the poke.
6. Free from pronounced fish odor (stale fish).
7. Free from "pugh marks" (blemish caused by a sharp prick by a fish fork while pitching fish) and other blemishes.
8. Free from water marks (reddish tinge on skin, seen close to spawning season).
9. Should be firm to touch and without loss of too many scales (latter seen in aged or stale fish).
10. Color of flesh, if king salmon, should be specified as "red" or "white."
11. Weight in accordance with bid specification.

##### Frozen (Round)

1. Free from rust (oozing fish oil which becomes oxidized).
2. Napes completely covered with a good coating of ice.
3. Free from intestinal burns.
4. Free from freezer dehydration (drying or scaly appearance).
5. Free from all other defects as stated under "Fresh (Round)."

##### Frozen (Steaks)

1. Uniform thickness (usually  $\frac{3}{4}$  inch).
2. Normal color of species presented (bright bloom).
3. Complete glazing (ice over cut surfaces of entire steak).
4. Test for detection of deterioration: break steaks nearest the nape (napes are the first to break down) and examine for pronounced fish or decomposed odors.
5. Hematoma (blood clot) in flesh denotes bruising. (If large percentage seen, can be assured that fish has not been troller-caught.)
6. Free from "pugh marks."
7. Free from other defects as stated under "Fresh (Round)."

#### FLAT-BOTTOM FISH

The flat-bottom fish are classified as follows:

1. Large mouth, right-handed: Halibut. Sand sole. Petrale sole. Flathead sole. Turbot. (Mouth opens to the

right abdominal cavity on the right side. Figure 2 of flat-bottom fish is right-handed.)

2. Small mouth, right-handed: English sole. Rock sole. Dover sole (slime, Chinese, slippery sole). Bellingham Bay sole (hybrid, bastard sole). C.O. sole. Rex sole. Flounder (commercial name).

3. Large mouth, left-handed: sand dabs. (Mouth opens to the left abdominal cavity on the left side. Anal fin on the left and dorsal fin on the right side.)

#### Halibut (Pacific)

This species is being included in the discussion of flat-bottom fish, as it falls in the same family (Pleuronectidae) as do the flounders. Halibut are caught by two different types of vessels, the dory and the long-lined vessel. The latter has supplanted the former, for it assures a faster and easier method of handling large quantities of halibut. When the fish are caught, they are stored on the deck in small partitions known as checkers. From the checkers the gills and viscera are removed from the fish and the poke (abdominal cavity) is filled with ice. The fish are then stored in the hold of the vessel with the white side (blind side) up and the head lower for proper drainage.

After obtaining its load, the halibut vessel goes to port where the catch is sold at the fish exchange to the highest bidder. At the fish establishment, the halibut are headed and graded according to size, quality, and appearance and stored on the floor on sufficient ice to assure minimum deterioration. The same precaution is taken as described previously for salmon to prevent the removal of slime if halibut are shipped fresh. The same method is used in handling and preparing halibut for storage as described for salmon.

Description: Dorsal rays, 91-107. Anal rays, 69-80. Lateral line with distinct arch in front, but without an accessory dorsal branch. Blind side is light in color and blends with light above. The dark or "eyed" side blends with sand and rocks at the bottom of the sea, making them indistinct.

Halibut are graded as to size, using commercial terms as follows: Babies, under 5 lb. Chickens, 5-10 lb. Mediums, 10-20 lb., 20-40 lb., 40-60 lb. Large, 60-80 lb., 80-125 lb. and up.

A classification is also based on the appearance of the halibut as follows: Best grade, uniform white in color on blind side, firm texture of flesh, and perfect condition. Grays, grayish tinge to the blind side. Scarred or blemished. Soft-textured flesh. Milkers, very soft texture of flesh.

#### OTHER FLAT-BOTTOM FISH

The rest of the species of flat-bottom fish (Pleuronectidae) are fished commercially by otter trawlers. This method involves the use of a net with two wings which act as a lead, forming a bag which gathers the fish. This bag net is towed at the bottom of the sea on known sole banks. Some banks have better fish than others. Some are known to fishermen as "hospital zones" (sickly or defective fish) and are avoided.

Because of the close resemblance of all species of flat-bottom fish, they are often filleted and sold as one and the same species. However, there are distinct variations in price as well as in the eating qualities. The following outline classifies and groups these species as to their commercial value and indicates which species are acceptable when mixed together:

- |                     |                         |
|---------------------|-------------------------|
| 1. Sand dab         | 6. (a) Rock sole        |
| 2. Petrale sole     | (b) Flounder            |
| 3. Sand sole        | (commercial name)       |
| 4. (a) Dover sole   | 7. (a) Turbot           |
| (b) Rex sole        | (b) Bellingham Bay sole |
| 5. (a) English sole | (bastard sole)          |
| (b) C. O. sole      |                         |
| (c) Flathead sole   |                         |

### Description

1. Sand dab: Large mouth. Left-handed. Eyes on right side. Mouth opens to left. Reversed to other species of flat-bottomed fish. Large scales, very loose to touch. Wrinkled appearance to skin on eyed side.

2. Petrale sole: Large mouth. Scales, small (none on the lateral line). Dorsal rays, 87-101. Anal rays, 67-79. Caudal rays, 19. Upper jaw with double row of conical teeth. Fine-grained flesh. Some are known to become very large.

3. Sand sole: Large mouth. Right-handed. Eyes, small. Dorsal rays, 72-85 (first ten are very long). Anal rays, 53-62. Two small sharp teeth in front of mouth. Flesh texture, firm, white, and fine-grained. No distinct arch of lateral line; has dorsal accessory branch.

4. (a) Dover sole (Chinese, slime, slippery): Dorsal rays, 94-116. Anal rays, 80-96. Pectoral fin less than length of head. Abundance of slime on surface, rubbery to touch. Light brown in color. Abdominal cavity extends approximately three-fourths of length of fish. Some are known to become very large.

(b) Rex sole: Small mouth. Large pectoral fin on eyed side twice the length of that on blind side. Dorsal rays, 87-110. Anal rays, 79-93. Skin brownish color on eyed side. Abundance of slime (slippery or rubbery to touch).

5. (a) English sole: Small mouth. Scales, smooth. Upper eye on dorsal line. Sharp nose. Long head. Dorsal rays, 72-89. Anal rays, 54-70.

(b) C. O. sole: Small mouth. Eyed side similar in appearance to rock sole but not rough to touch. Dark round spots on eyed side. Distinct "C O" on eyed side. Dorsal rays, 65-73. Anal rays, 46-55. Origin of dorsal fin on blind side on level with upper lip. First 5 or 6 dorsal rays occur on blind side.

(c) Flathead sole: Large mouth. Scales, small; 110-120 along the lateral line. Dorsal rays, 72-90. Anal rays, 57-71. Caudal rays, 18, with center rays longer. Tail, somewhat pyramid-shaped. Fins, edged in black. Roe (eggs), reddish in color.

6. (a) Rock sole: Small mouth. Dorsal rays, 67-82. Anal rays, 51-62. Rough surface to touch on both eyed and blind side. Has complete arch with accessory dorsal branch.

(b) Flounder: Small mouth. Right-handed, occasionally left-handed. Both eyed and blind sides rough to touch. Vertical (dorsal and anal) fins, marked with rather wide black bars. Lateral line without an arch or accessory dorsal branch. Flesh, very coarse-grained.

7. (a) Turbot: Large mouth. Dorsal rays, 95-111. Anal rays, 81-99. Teeth, arrowhead-shaped in adult. Caudal fin, distinctly V-shaped. Soft, sloppy, flabby flesh which separates into small pieces when cooked.

(b) Bellingham Bay sole (hybrid, bastard sole): Small mouth. Right-handed. Dorsal rays, 84-90. Anal rays, 50-61. Large scales. Very thin fish. Very soft-textured flesh (separates into small pieces when cooked).

## Grading Factors in the Inspection of Flat-bottom Fish

1. Halibut, fresh (round): Free from yellowish appearance (stale fish). Poke free from brownish discoloration (deterioration). Firm-textured flesh to touch (milkers and soft-textured not acceptable). Gray color on blind side is lower grade (not accepted unless specified in bids). Size (weight) specified according to bids.

2. Halibut, frozen (round): Poke free from brownish discoloration. Free from yellowish appearance. Complete covering of ice (glaze). Free from freezer dehydration (scaly or dry appearance). Size specified according to bids. "Grays" not accepted unless specified in bids.

3. Halibut, frozen (steak): Uniform in size (usually  $\frac{3}{4}$  inch in thickness). Belly on the blind side removed to  $\frac{3}{4}$  of an inch in thickness of flesh on dorsal end. Steaks from the poke free from brownish discoloration. Free from yellowish tinge. "Grays" not accepted unless specified in bids. Steaks cut from the size of fish specified in bids.

4. Sole, fresh (fillet): Species to be specified in invitation of bids. Clean-cut fillets and free foreign material. (Gills, slime, intestines, etc.) Free from intestinal burns (reddish brown color of abdominal cavity). Skin of flounders and rock sole should be removed on both blind and eyed sides. Soft milky fillets not accepted. Fillets with iodine odor objectionable (usually found in spring of the year in English sole; too pronounced not acceptable). Fillets should be uniform white in color except that fillets adjacent to eyed side may show slight brownish pigmentation from the skin. Pronounced fishy odor, stale or deteriorated fish is not acceptable. Free from reddish brown tinge in flesh adjacent to backbone and ribs which is result of deterioration (should not be confused with pigmentation from the skin on the eyed side).

5. Sole, frozen (fillet): Frozen in blocks according to specified bids. Good bloom as of fresh-appearing fillets. Free from yellowish color outside of glaze (rusting). Free from defects described under "Fresh Fillet."

## COD AND ROCKFISH

The various species of commercial importance are: ling cod, gray cod, black cod, red rockfish, and canaries (commercial name). All of these are fished commercially by otter trawlers and occasionally caught on halibut gear, with the exception of black cod which are fished commercially the year around with the same gear as that used in halibut fishing. They are all eviscerated and headed on the boats shortly after being caught. The abdominal cavity is filled with ice, and the fish are stored in the hold in ice. All cod are cut into fillets for Army use with the exception of black cod which are cut into steaks.

## Description

1. Ling cod: One continuous dorsal fin containing spines. There is a concavity or "wave" in the middle. Rather long anal fin. Very small scales. Tan with grayish black spots. Some ling cod have a bluish-green tinge (normal). Flesh white, very coarse-grained, and rather firm.

2. Gray cod: Dorsal fins, 3. Anal fins, 2. Upper jaw extends beyond the tip of the lower. Lateral line breaks into an arch at the anterior end of the second dorsal fin. Grayish-tan in color. Flesh white, rather coarse grained. Dorsal and anal fins margined in white.

3. Black cod (sablefish): Black in color. Dorsal fins, 2. No spines in the dorsal fins. Very small scales. Flesh white in color, very high in oil content.

4. Red rockfish: Reddish in color. One dorsal fin with spines. Three spines in the anal fin. Large scales. Peritoneum white in color. Flesh white with a tinge of pink, very coarse-grained, firm.

5. **Canaries:** Very similar in appearance to red rockfish. Yellowish with gray spots. One dorsal fin with spines. Three spines in the anal fin. Peritoneum is grayish to black. Flesh grayish white, coarse-grained, very soft. Canaries belong to the same species as red rockfish, but have much inferior quality of flesh. When canary fillets are frozen, they have a distinct grayish appearance.

#### Handling and Storing of Cod and Rock Fish

Cod, rockfish, and flounders are purchased by fish establishments that commercialize in filleting. However, this is with the exception of black cod which are frozen in the round.

At the filleting establishment, fish are stored on the floor with sufficient ice to assure minimum deterioration. Fish are washed thoroughly in washing tanks for complete removal of slime before being brought to filleting tables. Complete removal of slime from the fish is necessary in order that a clean fillet can be prepared. Fillets are then brought to the panning room where they are placed in pans (varying in size from 5 to 25 pounds), from there into the sharp freezer and frozen into blocks. Blocks are glazed, by the same method as described for salmon, and stored.

#### Grading Factors in the Inspection of Cod and Rock Fish

1. **Fresh:** Abdominal cavity should be free from brownish or yellowish discoloration and free from any intestinal burns. Free from any decomposed odor (pronounced fish odor). Head removed without too much flesh exposed (more exposed, the greater chance for decomposition). Very coarse-grained flesh.

2. **Frozen:** Frozen in rectangular-shaped blocks. Free from rust. Free from reddish tinge in flesh that lies adjacent to the backbone and ribs, which is a result of deterioration (this is not to be confused with pigmentation from skin on the skin side). Ling cod having a slight greenish-blue tinge should not be discriminated against. When cooked, will turn white. This is a normal condition of some ling cod. Very coarse-grained flesh. Blocks should be thoroughly covered with a coating of ice.

3. **Frozen steaks (black cod):** Free from blemishes. Free from brownish discoloration of the poke. Free from rusting (yellowish). Free from defects that are discussed under salmon steaks.

#### SALT HERRING

A considerable amount of Army inspection has been made on salt herring. Some of the points which should be checked are:

1. Bright luster to the eye of the fish is desirable.
2. Excessive loss of scales denotes stale fish.
3. Split the herring in two from the dorsal line to the backbone and detect decomposition by odor. Herring salted at too low temperature may decompose before salt penetrates the entire fish. Milt and roe are also used to check decomposition as they do not take up brine readily.
4. Check size according to specified bids.
5. Gib (removal of gills or of gills and viscera) according to bids.

#### THAWING OF FROZEN FISH

There has been considerable difficulty in some messes as to proper thawing of frozen fish. Fish should never be defrosted in warming ovens or in vessels of hot water. This rapid method of defrosting breaks down the tissue and results in a crumbly and mushy appearance. Fish should be defrosted at ice-box temperature (40° F.).

# The Diagnosis of Dengue

**MAJOR GEORGE V. LEROY**

Medical Corps, Army of the United States  
and

**CAPTAIN HOWARD A. LINDBERG**

Medical Corps, Army of the United States

Descriptions of epidemics of dengue in various parts of the world have appeared in medical literature since 1780. We have studied 71 cases in garrison troops between the ages of 20 and 35 years. Two features were sufficiently pathognomonic to aid in diagnosis. These features were the character of the terminal pyrexia and the evolution of the blood picture. While the possibility of variations between epidemics is realized in our cases, the clinical course was very similar to that of patients with experimentally induced dengue studied by Simmons<sup>1</sup> in the Philippines in 1931. In this epidemic the onset was sudden in 70 percent of the cases, occurring usually at night. The patient awakened with chills or repeated chilly sensations which were not severe and were not accompanied by much sweating. Headache, most severe in the frontal region, was common and usually associated with postorbital pain which was aggravated by lateral deviation of the eyeballs. Malaise, low back pain in the mid-lumbar region, joint pain most often back of the knees, backache, and arthralgia were common complaints. "Breakbone" pain was not characteristic of this epidemic, except in a few of the older patients. It was not unusual for a man to remain on duty two or three days with headache, backache, and low-grade pyrexia before reporting his illness. Mild sore throat, slight hacking cough, and anorexia were other symptoms. A few entered the hospital because of a rash, and these had usually experienced only mild symptoms for three to five days preceding admission. The average patient appeared listless and only moderately ill.

## PHYSICAL EXAMINATION

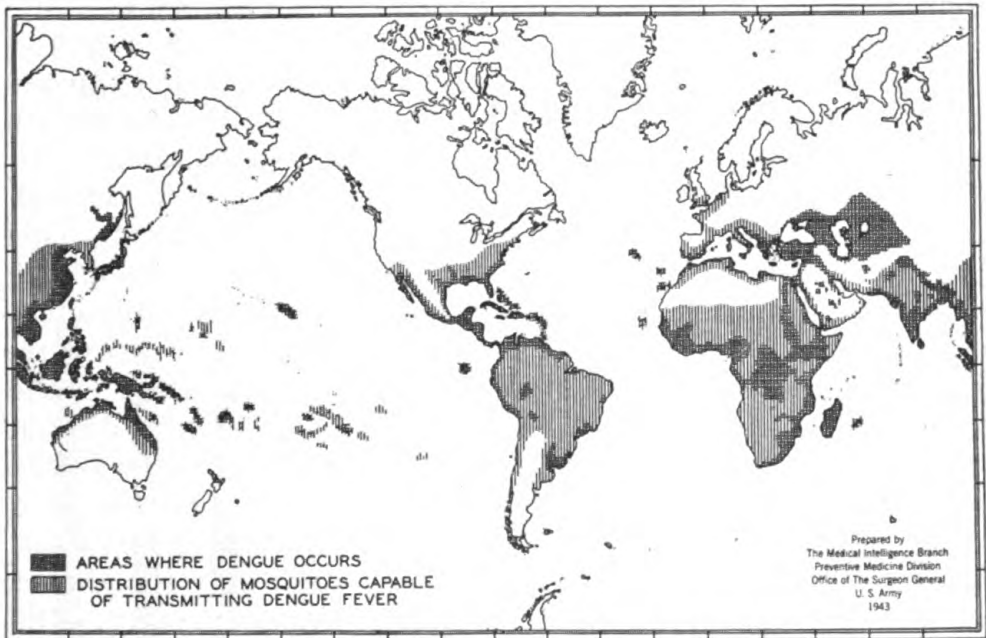
The temperature varied from 100° F. to 105° F. The skin was warm, flushed, and dry. In spite of the frequent complaint of postorbital pain, the conjunctivae were only moder-

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1. Simmons, J. S.: Dengue Fever, *Med. Clin. N. America*, 27:808-821, May 1943. Simmons, J. S., St. John, J. H., and Reynolds, F. H. K.: *Experimental Studies of Dengue*, Monograph No. 29, Bureau of Science, Manila, 1931.



ately injected. The mucous membranes of the nose and throat were either normal or but slightly injected. Examination of the lungs seldom revealed any abnormalities. In a few instances evanescent crepitant rales were heard at the bases of the lungs posteriorly; and in two patients a fine pleural friction rub was detected. The heart rate was usually slow in proportion to the temperature. The blood pressure was within normal limits. In some patients there was resistance to flexion of the neck, but no true stiffness was observed. Lumbar puncture was performed on one of these. The pressure and the composition of the cerebrospinal fluid were normal, but the headache was relieved immediately. Enlargement of the



lymph nodes was the most striking feature of the physical examination. It was not particularly prominent early in the disease but became more apparent during the course and often developed very rapidly. The involvement of the lymph nodes in order of frequency was posterior cervical, submental, postauricular, axillary, epitrochlear, suboccipital, and inguinal. The enlarged nodes seldom exceeded a maximum dimension of 2 cm. by 3 cm. Tenderness was apparent only if the nodes were pressed firmly. Orchitis was observed in one patient.

Knowledge of the mode of onset and examination of the patient on admission seldom permitted a definite diagnosis; only after observing the course of the disease and frequent hematological studies did the diagnosis become certain.

## COURSE

The severity of the onset determined the severity of the course of the disease. When a patient had severe headache and arthralgia at the onset, he would continue to have these symptoms to a marked degree throughout the course of the disease, with a distinct exacerbation at the time of the terminal pyrexia. This seemed to be true regardless of the amount of elevation of temperature during the first three to five days. On the other hand, a patient whose symptoms were mild at the onset was comparatively free of complaints until the appearance of the terminal pyrexia. Irrespective of the severity of the first phase of the disease, the symptoms in most patients were definitely aggravated at the time of the terminal pyrexia.

A majority of the patients had a rash which occurred early in about one-third of them. It was often difficult to determine whether this early rash was a true exanthem or simply a febrile erythema, and it had often disappeared forty-eight hours after the onset of symptoms. A more characteristic rash was seen just before the onset of the terminal pyrexia. This rash appeared suddenly and involved a definite area of the body. The exanthem consisted of macules about 3 millimeters in diameter, of a bright pink color, which faded on pressure. Maculopapules were occasionally observed, most often in the skin of the colored patients. The eruption was discrete, did not coalesce, and did not tend to form patterns. The rash was distributed evenly over the neck, thorax, upper abdomen, and arms. Rarely it was on the lower abdomen, face, forearms, and legs. It persisted unchanged for about twenty-four hours after defervescence had occurred, then faded rapidly. The rash was rarely seen on the wrists or ankles. In two patients the terminal rash was purpuric and involved the lower portions of the legs and feet.

## FEVER

The average duration of the fever was six days; the maximum was eight, and the minimum three days. The characteristic temperature curve comprised an abrupt onset of fever rising in a few hours to 102°-104° F.; then the fever declined to 99° F.-102° F., which was maintained until the final stage; then the terminal pyrexia occurred with an abrupt increase superimposed on the basic level. The fever observed at this time was almost always the highest temperature recorded during the course of the disease. The most striking feature of the

terminal pyrexia is the abrupt rise and the equally abrupt fall to normal. Immediately after this defervescence by crisis the patient was comfortable. Sixty-four of the 71 patients studied had the terminal pyrexia. Of these, 16 entered hospital during this stage of the disease, and became afebrile within twenty-four hours. Of the 48 patients with terminal pyrexia who were observed throughout the course of the disease, 30 had an increase in temperature at that time of more than  $2^{\circ}$  F. higher than the preceding day. The duration of the stage of terminal pyrexia was as follows: 24 hours or less, 16; 24 to 48 hours, 32; 48 to 72 hours, 5; indefinite, 11.

After the crisis, convalescence was rapid and uneventful and by the end of a week most patients were fit for duty. Although mental depression and effort syndrome have been described as common sequelae, we did not observe them in any patient.

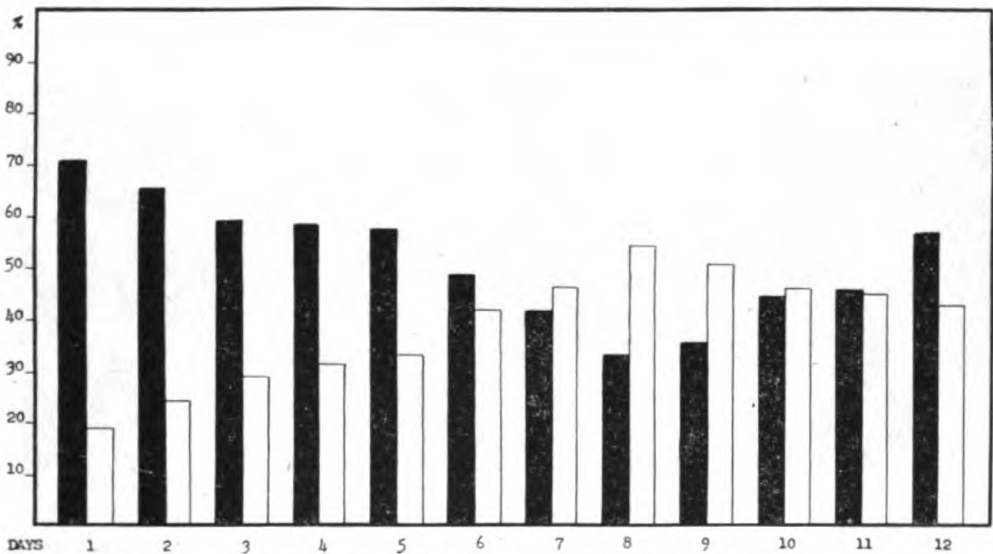


FIGURE 1. The differential blood count in dengue. The solid blocks represent the percentage of granulocytes; the white blocks, the percentage of lymphocytes.

#### BLOOD STUDIES

The blood picture in patients with dengue was quite specific. The erythrocytes, hemoglobin value, and platelets were normal at every stage of the disease. The sedimentation rate (Wintrobe method) was normal. The significant hematologic changes are observed only in the leukocytes. There are four characteristic features of the blood picture: (1) leukopenia of moderate degree; (2) granulopenia during the period of convalescence; (3) toxic vacuoles in the monocytes

during the febrile period; and (4) Turck irritation leukocytes during the period of the terminal pyrexia and convalescence. The most significant observation that we made is that the greatest abnormality of the blood occurred during the convalescent period, after the cessation of the terminal pyrexia, and at a time when the patient was feeling quite well.

Leukopenia is generally considered present in dengue. In our cases, this was true with certain qualifications. The average of the lowest white blood cell counts for each patient was 4630 per mm.<sup>3</sup> The range was from 2100 to 7400 per mm.<sup>3</sup> The average of all the white blood counts, grouped according to the day of the disease when it was made, was as follows: 1st to 3d day of disease, 6,128; 4th to 6th day, 5,174; 7th to 9th day, 6,200; 10th and later days of disease, 6,700. It is apparent that, although leukopenia may occur, very low leukocyte counts are exceptional, and the over-all average is within normal limits.

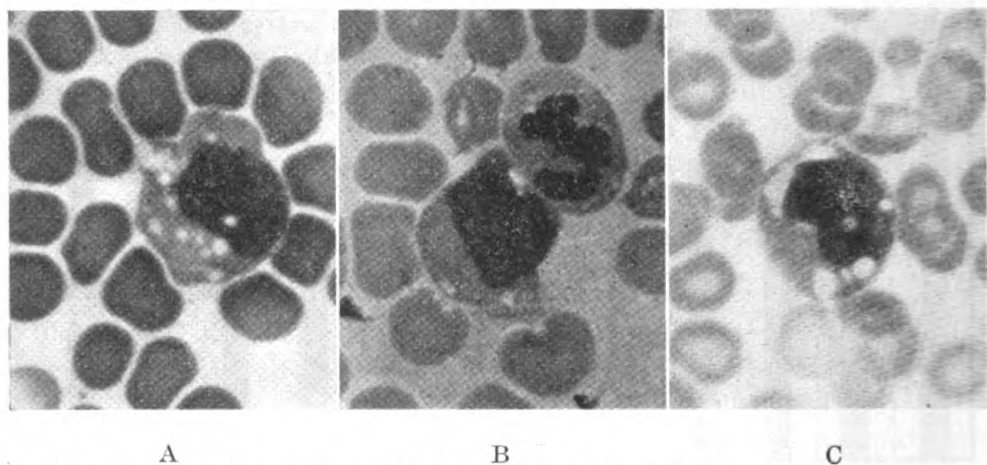


FIGURE 2. Photomicrographs A and C show vacuolated monocytes; B, a vacuolated monocyte and a toxic granulocyte. X1000.

The percentage of granulocytes in the blood decreases slightly, but steadily, during the first six days. From that time until the eleventh day, there is a marked decrease after which the percentage of granulocytes returns to normal. In general the least granulocyte percentage recorded was from 30 percent to 40 percent, although in 3 patients values below 20 percent were observed. Since these low values occurred at times when the total white blood count was low, it is obvious there was a reduction in the absolute number of granulocytes. Coincident with the granulopenia, there was an increase in the

TABLE I  
*Average percentage of granulocytes*

Day of disease	Percent	Number of counts
1	72	3
2	66	16
3	59	22
(1st three days)	(64)	(41)
4	58	32
5	57	26
6	48	22
(2d three days)	(55)	(80)
7	42	19
8	33	23
9	36	20
(3d three days)	(36)	(62)
10	45	15
11	46	11
12	57	11
13+	49	14
(Final days)	(47)	(51)

*Average percentage of lymphocytes*

Day of disease	Percent	Number of counts
1	19	3
2	24	16
3	29	22
(1st three days)	(26)	(41)
4	32	32
5	33	26
6	42	22
(2d three days)	(35)	(80)
7	47	19
8	54	23
9	51	20
(3d three days)	(51)	(62)
10	47	15
11	45	11
12	43	11
13+	43	14
(Final days)	(45)	(51)

percentage of lymphocytes. The reciprocal relationship of the variation in the percentages of these two cell-types is shown in figure 1, and the data from which the graph is constructed is collected in table I. Inasmuch as the increased percentage of lymphocytes occurred when the total white blood cell count

was reduced, it is difficult to say whether an absolute lymphocytosis occurred or not. The granulocytes throughout the entire period of observation were found to be moderately "toxic," with typical toxic granulations and small toxic vacuoles. An increase in the percentage of "band" forms was observed; but a shift to the left was not marked enough to be significant for diagnosis.

A striking feature of the thin blood films early in the disease was the appearance of the monocytes. These cells were found to contain large vacuoles in the cytoplasm and in the nucleus. Typical examples are shown in figure 2. When stained supravitaly with neutral red, the vacuoles were basophilic, which distinguished them from "digestion" ones that are often seen in phagocytic cells. The vacuoles were as large as 2 microns in diameter, and the number observed varied from 1 to 14. The monocytes were otherwise normal in every respect. These vacuolated cells were present from the onset and usually had disappeared from the blood by the end of the period of terminal pyrexia. They were so striking and were seen so regularly that the laboratory technicians often suggested the diagnosis of dengue. The percentage of monocytes—vacuolated and normal—varied from 3 percent to 20 percent, but the average value was 7 percent in each stage of the disease. The finding of vacuolated monocytes may be considered as presumptive evidence for dengue when they are found in the course of an epidemic. In our judgment, however, these cells are not truly pathognomonic of dengue.

Typical Turck irritation leukocytes were regularly seen in blood films of patients who were convalescent. The number observed varied from 1 to 20 percent, and their appearance in the blood coincided with the decrease in the granulocytes. As the blood picture returned to normal, the Turck cells disappeared. We do not think these cells are significant except as a component of the total blood picture.

#### COMMENT

It seems that descriptions of dengue in terms of "breakbone fever," saddleback fever, and marked leukopenia may be misleading. In the healthy young adults studied, pain severe enough to merit the term "breakbone" was seldom encountered. Many of the patients remained ambulatory until the onset of the terminal pyrexia. In the older patients, a breakbone type of pain was described, and it is possible that in an unselected group containing older and less fit individ-

uals this symptom may be more common. We would like to emphasize that severe arthralgia is not a necessary component of the symptom complex. In the majority of our patients the severity of the discomfort at the onset was no greater than that of malaria or the ordinary febrile catarrhs.

The phrase "saddleback fever curve" is unfortunate for it implies a biphasic temperature record composed of two periods of ill-defined pyrexia connected by a relatively brief period of normal temperature. This impression, moreover, is strengthened by some of the "average" temperature records described in the literature. A careful study of the fever charts of our patients demonstrated that this concept is not necessarily so. The typical record could be divided into three phases: (1) the initial fever, which rose rapidly and persisted for twenty-four to thirty-six hours, after which there was a decline to a level of temperature varying from 99° F. to 102° F.; (2) the intermediate period, which lasted for two to four days, during which time there was a continuous fever which was maintained at whatever level the temperature attained at the end of the first period; (3) the terminal pyrexia, when the temperature rose abruptly and reached the highest point during the period of observation. This final phase was terminated most often by crisis; and its total duration was from one to two days. Before the terminal pyrexia occurred it was not common for a patient's temperature to return to normal.

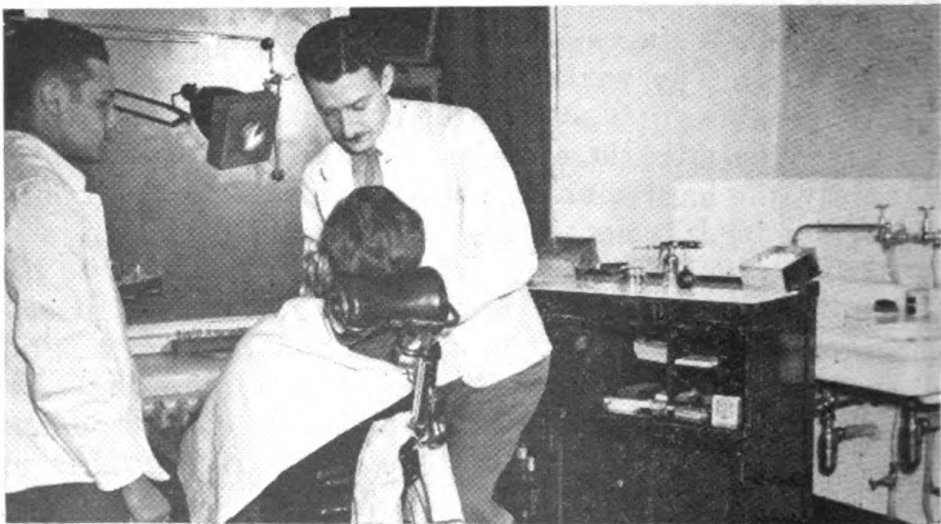
The hematologic observations which we have described are unusual, for the most striking abnormalities occur during the period of convalescence. The leukopenia which accompanies the febrile stages of the disease is moderate and not at all diagnostic. The vacuolated monocytes occur early and are quite reliable guideposts to the correct diagnosis. Following the terminal pyrexia, at a time when the patient is improving rapidly, the most characteristic blood changes occur. This is important for it is not usual to continue studying the blood of a patient who is obviously well. The reduction in the percentage of granulocytes in the differential blood count commences during the terminal pyrexia and continues for a period of three to six days and then returns rapidly to normal. The percentage of granulocytes may become as low as 20 percent, and values from 20 percent to 30 percent are regularly observed. There is a concurrent increase in the percentage of lymphocytes during this time; at the same time Turck irrita-



tion leukocytes are seen. The hematologic pattern which we observed provides a characteristic blood picture for dengue and one which, to our knowledge, has not been described. A careful study of the blood at the appropriate time has been particularly valuable in the interpretation of clinically atypical cases, and of cases which entered the hospital late in the course of the disease. An appreciation of the nature of the typical blood picture and the typical terminal pyrexia has been most useful in differentiating dengue from malarial fever, the infectious exanthemata and the catarrhal fevers.

#### CONCLUSIONS

In a study of 71 cases of dengue, an effort was made to define more accurately the febrile course of the disease. The significance of the terminal pyrexia and of the blood pictures has been emphasized. The pathognomonic blood picture described consists of the following: (1) a moderate leukopenia, which is most marked at the time of the terminal pyrexia; (2) the presence of vacuolated monocytes in the blood during the febrile stages of the disease; (3) the development of marked neutropenia and lymphocytosis during convalescence; and (4) the presence of Turck irritation leukocytes in the blood during convalescence. The finding of vacuolated monocytes and Turck irritation leukocytes at appropriate stages of the disease is believed to be presumptive evidence for a diagnosis of dengue. The marked neutropenia in convalescence is presented as a specific diagnostic feature of dengue.



Dental clinic of the Fighter Group, Eighth Air Force.

# Experimental Use of Penicillin in Treatment of Sulfonamide-Resistant Gonorrhea

CAPTAIN ROBERT J. MURPHY  
Medical Corps, Army of the United States

The purpose of this paper is to discuss the experimental use of penicillin in the treatment of 306 cases of sulfonamide-resistant gonorrhea. A prescribed course of chemotherapy consists in the administration of one gram of sulfathiazole or sulfadiazine every six hours day and night for five days, or a total of 20 grams. A case is considered sulfonamide resistant when it fails to respond to two prescribed courses with a five-day rest interval between the two courses. Nearly all of our cases had been transferred from other hospitals in the service command after having failed to respond to routine therapy. The amount of drug received by these patients prior to admission for penicillin treatment varied from 40 grams to as much as 750 grams in isolated cases. The majority had received more than 100 grams of sulfonamides, and many had failed to respond to such other therapeutic procedures as mechanical fever, intravenous typhoid, and urethral irrigations with silver protein preparations. All cases selected for this study had definite clinical signs of urethritis and in every case there was a frank urethral discharge. Prior to the administration of penicillin therapy, a positive culture and smear were obtained in each case. Laboratory confirmation of a clinical diagnosis was obtained in every instance. No other type of treatment was administered in conjunction with the penicillin therapy.

Ten thousand units of sodium salt of penicillin were dissolved in each 2 cc. of sterile distilled water used. The drug was prepared fresh on the day it was to be administered and after preparation was refrigerated until it was administered. The drug was administered in every case by the intramuscular route in the upper outer quadrant of the buttock.

All patients were confined to the hospital during treatment and the entire follow-up period in order to eliminate any confusion between penicillin failures and the possibility of reinfection. The period of observation was twenty-one days following the date of treatment. Daily inspection of the urethra for discharge and two glass urine tests were made in each case.

## CRITERIA OF CURE

Following the administration of penicillin, the prostate was massaged at forty-eight hour and seven, fourteen, and twenty-one day intervals and from the fluid obtained culture and smears were made. If tests were negative at these intervals the treatment was considered successful. Cases that revealed the persistence or reappearance of clinical signs and confirmed by positive laboratory evidence were considered failures. After re-treatment on another schedule the case was required to fulfill the same criteria of cure.

## TREATMENT SCHEDULES

*Schedule A.* Fifty patients received 10,000 units of penicillin every three hours for sixteen doses with a total of 160,000 units over a forty-five hour period. All patients in this group fulfilled the criteria of cure. Ten of these patients in addition to being sulfonamide resistant had failed to respond to one session of mechanical fever therapy.

*Schedule B.* Sixty-five patients were treated by the administration of 20,000 units of penicillin every three hours for five doses or a total of 100,000 units over a period of twelve hours. Only one failure resulted from this scheme of treatment. In this group were three cases complicated by gonorrheal conjunctivitis which in all three responded to penicillin as readily as did the urethritis.

*Schedule C.* To sixty-four patients 10,000 units were administered every three hours for five doses or a total of 50,000 units over a twelve-hour period. There were twelve failures.

*Schedule D.* This scheme of treatment contains too few cases from which to form conclusions. The schedule was discontinued for technical reasons and it is mentioned for the purpose of adding the cases to the total number treated. Ten cases were given 5,000 units of penicillin every three hours for ten doses, with a total of 50,000 units over a twenty-seven hour period. There were two failures in this group. Of interest is the fact that seven more cases were thought to have received 50,000 units but through error by the manufacturer in labeling, the patients actually received only 35,000 units. All seven cases fulfilled the criteria of cure.

*Schedule E.* Among thirteen cases which received 20,000 units of penicillin every three hours for three doses or a total of 60,000 units over a six-hour period, seven failures resulted. It became apparent that the scheme was inadequate and it was thought advisable to discontinue this procedure.

*Schedule F.* Sixty-one cases were administered 20,000 units at the first injection, followed by 10,000 units every three hours for four doses or a total of 60,000 units over a twelve-hour period. There were eight failures in this group.

*Schedule G.* This plan is under study at present and to date thirty-six cases have been administered 20,000 units at the

first injection, followed by 10,000 units every three hours for five doses or a total of 70,000 units over a fifteen-hour period. There were four failures.

*Schedule H.* This is the plan whereby penicillin therapy failures from all other plans of treatment were re-treated. A total of thirty-four penicillin failures from all the other treatment schemes were re-treated by administering 10,000 units every hour for ten doses or a total of 100,000 units over a nine-hour period. The three failures on this schedule were again re-treated by using Schedule A and all three fulfilled the criteria of cure.

TABLE I  
*Cases treated, schedules employed, and results*

Schedule	Number of cases	Unit dosage	Dose interval (Hours)	Total doses	Total treatment time (Hours)	Total dosage (Units)	Failures	Percent cured
A	50	10,000	3	16	45	160,000	0	100
B	65	20,000	3	5	12	100,000	1	98.4
C	64	10,000	3	5	12	50,000	12	81.2
D	10	5,000	3	10	27	50,000	2	80
	7	3,500	3	10	27	35,000	0	100
E	13	20,000	3	3	6	60,000	7	46.1
F	61	20,000	1st dose					
		10,000	3	5	12	60,000	8	86.8
G	36	20,000	1st dose					
		10,000	3	6	15	70,000	4	88.8
Total	306							
H*	34	10,000	1	10	9	100,000	3	91.1
A <sup>1</sup>	3	10,000	3	16	45	160,000	0	100

H\* Re-treatment scheme for failures on Schedules B,C,D,E,F,G.

A<sup>1</sup> Re-treatment scheme for failures on Schedule H.

#### SUMMARY

A total of 306 cases of sulfonamide-resistant gonorrhea were treated with penicillin by one of several treatment schedules as outlined. Of this number 262 cases were cured following the first trial on penicillin. An aggregate of thirty-four failures resulted or an over-all cure rate of 88.8 percent for all treatment schedules.

The 34 accumulated failures, following the first treatment on one schedule, were re-treated in accordance with Schedule H and of this group there were three failures following re-treatment. The total number of cases cured was thus raised to 303 by the application of a second course of penicillin. This gives an over-all cure rate of 99 percent. The three failures from Schedule H, or second trial of drug, were re-treated using Schedule A, and all three responded. Thus, the total group of 306 cases originally treated were eventually cured by the use of penicillin.

#### CONCLUSIONS

1. The foremost clinical observation in the entire series of cases was the persistence of urethritis following treatment, even though the smears and cultures remained negative. The character of the discharge changed, following treatment, from a purulent to a thin, watery one. Further, the mucous membrane of the urethra remained inflamed, glistening, and moist beyond the time of disappearance of the watery discharge. In the majority of our cases it was about one week after treatment before all evidence of the infection disappeared.

2. In spite of the persistence of objective symptoms such as discharge and inflammation, all subjective symptoms such as dysuria, polyuria, hematuria, and nocturia usually had subsided by the time the last treatment had been administered.

3. Daily observation and recording of two glass urine tests revealed that the urine, after becoming clear, retained shreds in the majority of cases throughout the entire follow-up period.

4. There is no apparent correlation between the length of time the infection has been present, whether the individual had a previous infection, total dosage of sulfonamide that had been taken, and the cure rate.

5. Only one reaction from treatment with penicillin was encountered and in that patient a generalized urticaria came on five days following treatment and persisted for three days. Other possibilities to account for the urticaria could not be ruled out but we assume it was due to penicillin.

6. It appears that gonorrheal conjunctivitis responds promptly and is cured by the intramuscular administration of penicillin.

7. Acute suppurative prostatitis responds slowly but favorably following penicillin therapy. This fact is evidenced by the marked reduction in the size of a swollen, boggy, and tender prostate following treatment. Chronic prostatitis with fibrosis and scarring shows no appreciable change following the use of this drug.

8. Four cases of gonorrheal arthritis with concomitant gonorrheal urethritis received no apparent benefit from penicillin, and in every case following the cure of the urethritis other treatment procedures for the arthritis were required for improvement or cure.

9. The efficacy of penicillin for the cure of gonorrheal epididymitis could not be ascertained. Eight of our cases had this complication but they seemed to run their customary course in spite of penicillin therapy.

10. Two cases had large periurethral abscesses which responded promptly to penicillin and no further treatment was necessary.

11. Failures on penicillin therapy manifest themselves early. Of the thirty-four failures, twenty-nine showed clinical and laboratory evidence of infection at the time the forty-eight hour culture was taken. Four cases were obvious failures at the time the seven-day culture was taken, and in only one case did a failure manifest itself after the seventh day. It is apparent that the period for criteria of cure can be considerably shortened.

12. Response to treatment and cure is very effectual by administering 20,000 units every three hours for five doses, or a total of 100,000 units over a twelve-hour period. This seems a very desirable method both from the standpoint of cure rate and the convenient time period over which it is administered. The time factor will be of even greater importance when penicillin therapy is available for treatment of ambulatory cases that remain on duty status.

13. The success of penicillin therapy in the treatment of gonorrhea is dependent on the size of the individual dose, total dosage used, and time over which it is administered.

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## Modified Orthopedic Table Constructed in the Field

CAPTAIN VICTOR MAYER

Medical Corps, Army of the United States

The lack of an adequate orthopedic table in a small military hospital in an isolated area presents an important problem. Illustrated here is an orthopedic table made locally overseas from salvage material. In over-all structure it resembles the table depicted in Military Surgical Manual IV, Orthopedic Subjects, pages 81-83. The design is arranged to permit flexibility to cover as many situations as possible and to permit construction with materials usually available in a salvage dump. The production of this valuable piece of equipment illustrates the versatility and cooperation among the

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Captain Henry I. Ilg, A. C., and S/Sgt. S. P. Zesniowicki assisted in making the table.



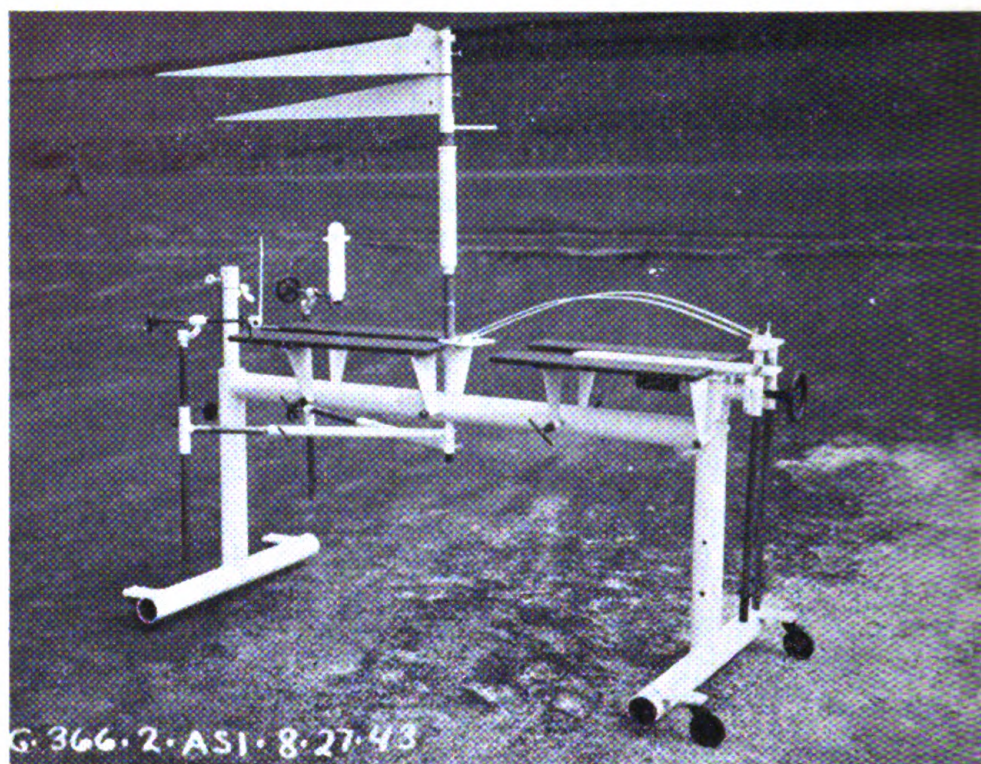


FIGURE 1

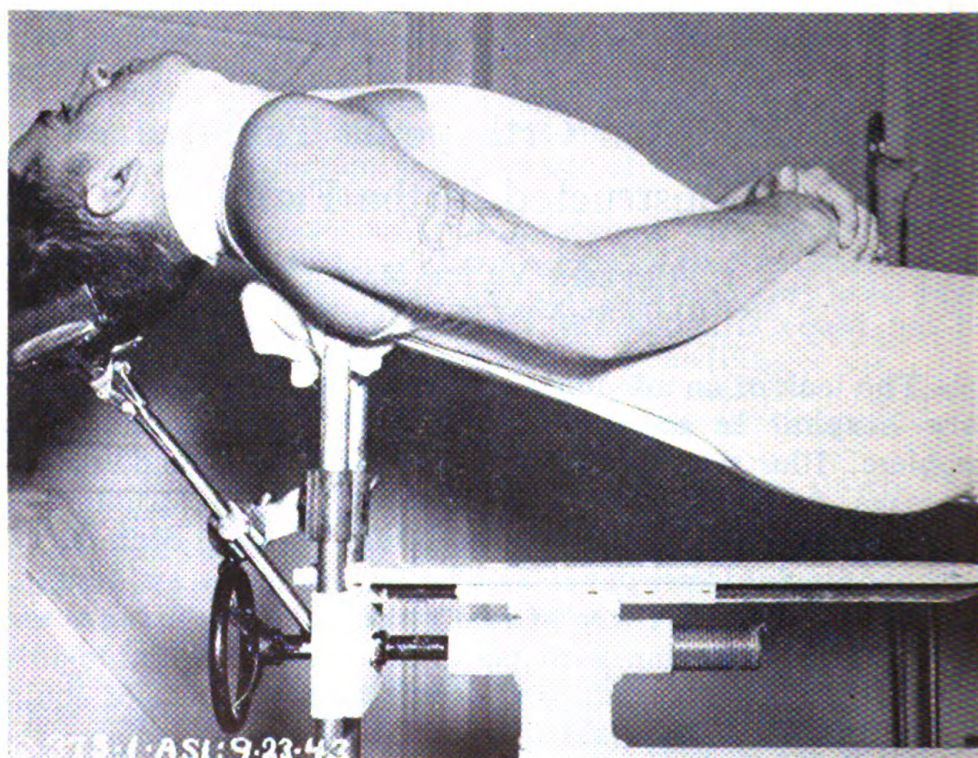


FIGURE 2



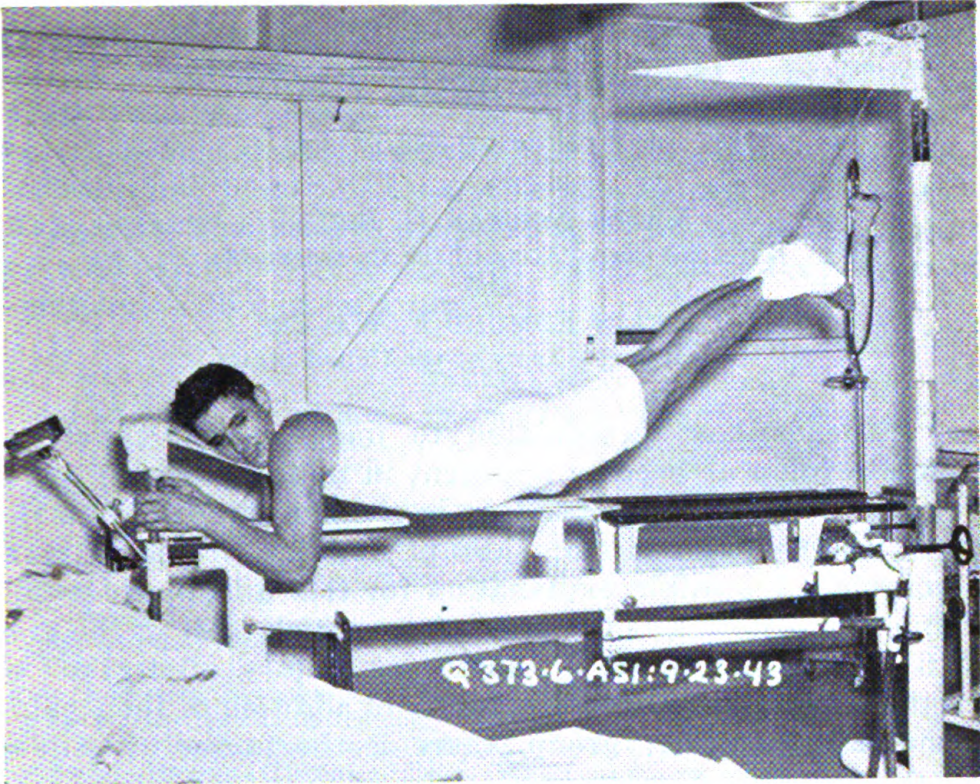


FIGURE 3

various branches of the military service. This table (figure 1) can be readily converted to an auxiliary operating table by the addition of a wooden top and mattress.

Figure 2 shows the headrest and sling support for application of casts to the cervical region. The headrest is the same as that found on the chair listed in the Supply Catalog as "Chair, specialists"; it is made applicable to the table by constructing a horizontal sliding bar to the vertical tubes.

Figure 3 illustrates the sling, with the patient in position for the application of a hyperextension cast in prone position.

Figure 1 shows also the use of Goldthwait irons for application of hyperextension casts in the supine position.

The supporting post is interchangeable from the foot to the center of the table.

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**Pests.**—The Fiji Islands abound with mongooses and toads, both of which are harmless to humans. The mongooses were imported long ago to destroy snakes. Eventually they became pests in their own right, devouring crops when there were no more snakes. The toads were imported to get rid of the insects, but they multiplied so swiftly that they, too, became a problem. (War Department press release, 5 May 1944)

# Psychoses in the Army

## Follow-up Study

MAJOR NORMAN Q. BRILL

Medical Corps, Army of the United States  
and

CAPTAIN EDMUND F. WALKER

Medical Corps, Army of the United States

Evidence has accumulated to indicate that psychoses which develop or become apparent in military service differ in many respects from those seen in civilian practice. In many instances the onset is more abrupt and the prognosis more favorable. A possible explanation for this difference is that soldiers constitute a select group from which most of the men with obvious emotional instability or history of nervous or mental disease have been excluded. In addition to their being a mentally healthier group, there is the factor of sudden psychic trauma. The strain placed on the individual exposed to the radical change in mode of existence that military service entails is apparent. Removal of the patient from a military environment and return to civilian life might therefore be expected to result in rapid improvement. The present study was undertaken to determine if such were the case.

Follow-up reports were received on 183 patients who had been discharged from the service for psychoses. The cases were not selected. None of the patients had been on foreign duty. The type and number of patients included in the study were as follows:

Dementia praecox .....	113
Manic depressive psychosis .....	8
Psychosis with mental deficiency .....	30
Psychosis with psychopathic personality.....	13
Chronic alcoholic psychosis .....	6
Undiagnosed psychosis .....	14
Psychosis with epilepsy .....	1
Posttraumatic psychosis .....	1

The distribution of cases according to diagnosis and length of service prior to hospitalization is shown in table I. Forty patients had been hospitalized without having completed one month of service and 110 before completing

six months of service. Of the different types of dementia praecox, the simple type was a little more likely to be admitted earlier than the others. Those with manic-depressive psychoses, chronic alcoholic psychoses, and the organic psychoses generally had longer periods of service before requiring hospitalization. The trend in the psychoses with mental deficiency and with psychopathic personality was similar to that observed in patients with dementia praecox.

TABLE I  
*Incidence of psychosis in relation to length of service*

Diagnosis	0-3 months	3-12 months	Over 12 months
Dementia praecox			
Simple type	12	6	2
Catatonic type	6	3	5
Paranoid type	14	11	4
Hebephrenic type	16	10	7
Unclassified	6	7	1
Manic-depressive psychosis	1	3	4
Psychosis with mental deficiency	16	7	7
Psychosis with psychopathic personality	6	4	3
Psychosis, alcoholic (chronic)	0	2	4
Psychosis, undiagnosed	7	5	2
Psychosis with epilepsy	0	0	1
Psychosis, posttraumatic	0	0	1
Total	84*	58	41

\*40 of these were hospitalized with less than one month's service.

Other than reassurance and encouragement, little in the way of psychotherapy was offered. No shock therapy was used in these patients but an organized program of recreational and occupational therapy was provided. The problem was chiefly one of diagnosis and disposition. Patients who did not require further hospitalization were discharged to their own custodies. If further hospitalization was necessary, the patient's relatives were so advised but were given the opportunity to accept custody of the patient provided they signed affidavits signifying their ability to provide proper care. Where relatives did not desire to have the patient at home, arrangements were made for transfer to a state or veterans' hospital.

Those whose line of duty was "No" by reason of the existence of symptoms prior to entering the service or of having developed symptoms prior to the expiration of six months' service were sent to state hospitals. Those whose line of duty

was "Yes" were admitted to veterans' hospitals. On 17 March 1943 all men in the service became eligible for veterans' hospital care.\* All the cases included in this study were discharged prior to that time. This accounts for the state hospital admissions. The disposition of the patients is indicated in table II; almost 50 percent were discharged to the custody of relatives.

TABLE II  
*Disposition of patients on discharge from the service*

Discharged at home	
To own custody .....	14
To custody of relatives .....	89
Discharged in camp to own custody .....	9
State hospital or state agency .....	55
U. S. veterans' hospital .....	14
U. S. Army general hospital .....	2
Total .....	183

The average period of hospitalization for the entire group was about two months. Fourteen patients made spontaneous recoveries and 12 showed marked improvement. The condition of the great majority of patients remained unchanged and 2 became worse as shown in table III. Of those who recovered, 5 had psychoses with mental deficiency, 3 had psychoses with psychopathic personalities, 2 were cases of dementia praecox, catatonic type, 2 had undiagnosed psychoses, 1 had dementia praecox, unclassified, and 1 had an alcoholic psychosis. All of these patients were reported as still well on follow-up except the alcoholic who had a recurrence.

The information used in this study was obtained from reports from relatives and hospitals. To reassure those who might be wary and noncommittal, it was made clear by correspondence that the information was not to be used in connection with any further relations of the patient to the Army or Government. An attempt was made to ascertain whether the individual was ill or well; if ill, in what way; if he had improved since returning home or since discharge from the Army; how his present condition compared with his condition prior to entering the service; what medical or hospital care he had required since discharge (where this information

\*Public Law No. 10, 78th Congress, approved 17 March 1943, grants the status of "a veteran of any war" to all militarized individuals who served on or after 7 December 1941, and prior to the cessation of hostilities in the present war, and who will not be dishonorably discharged.

was not already at hand); whether or not he was working, the amount and kind of work, and if his work was of the same character as prior to induction. It was gratifying to receive prompt replies to all of the inquiries. Many families seemed pleased over the continued interest in the patients, and the hospitals, despite their shortage of help, were generous in supplying the data requested.

TABLE III  
*Condition on discharge from service*

Recovered .....	14
Markedly improved .....	12
Moderately improved .....	46
Slightly improved .....	10
Unchanged .....	99
Worse .....	2
Total .....	183

TABLE IV  
*Condition at follow-up\* compared with condition at discharge from service*

	0-6 months	6-12 months	12-24 months	Over 24 months	Total
Well	12	24	26	0	62
Ill, but improved	18	27	19	1	65
Ill, and unimproved	19	26	10	0	55
Dead	0	0	1†	0	1

\*When condition at follow-up was compared with condition at induction it was found that 9 were better than they had been; 90, unchanged; and 83, worse.

†Died of fractured skull.

TABLE V  
*Work status of discharged patients*

Full time .....	77
Part time .....	29
Not working .....	67
Total .....	173

#### FOLLOW-UP

Sixty-two patients were reported by their families as completely well; 65 were still ill but improved; 55 were ill and unimproved, and 1 had died of a fractured skull. The length of follow-up for the different groups is shown in table IV.



Seventy-seven patients were working full time; 29, part time; and 67 were not working (table V). Of the 67 who were not working, 34 were still in hospitals. Information on the level of work when supplied revealed no decline in the ones who were employed. Many were doing the same kind of work while others held better jobs than they had before entering the Army. Employment is much easier to obtain now because of the war, and employers necessarily are less critical in hiring men. Some of the patients, therefore, might not have been able to obtain jobs if times were normal. It has been necessary to accept the statements of relatives concerning the patients' condition. Some of the reports may be inaccurate and some patients described as "well" may still be ill. However, others may be reluctant to admit that some are recovered for fear of relinquishing possible claims against the Government. The fact that a comparatively small percentage of patients still require hospital care is some confirmation of the trend toward recovery and satisfactory adjustment. Comparison of the data in tables IV and V indicates that many of the patients who are working are not well but they are for the most part those who have been reported as "ill but improved."

Seventy-one patients were transferred to hospitals for further treatment, and hospitalization was recommended in many others on discharge from the Army. Only 34 were in institutions at the time of this study (table VI). Fourteen were under the care of private physicians, generally not psychiatrists, and one was being followed in a hospital outpatient clinic. Seventy-two percent of the entire group were receiving no medical care.

#### COMMENT

Reported complete recovery in about one-third of this group of cases is not in itself remarkable. Numerous statistical studies of state hospital admissions have shown significant trends toward spontaneous recovery in early cases. A true comparison cannot be made between this group and one drawn from civilian life because the population from which these patients were drawn was a select aggregation of seemingly healthy young men who had passed induction-board examinations. Those with known histories of nervous or mental disorder or who appeared unstable had mostly been weeded out. However, the rapidity of recovery in many of our patients and the fact that 61 percent of those on whom such information

was received were working is striking. Although 120 patients are not well, only 51 are receiving medical attention and of these 34 are in hospitals. The failure of the others to obtain medical care cannot be attributed to lack of facilities since veterans' hospital care is available to practically all.

Rapid recovery of psychotic patients in the Army was observed during World War I. The commanding officer of United States Army General Hospital No. 43, National Soldiers' Home, Hampton, Virginia, reported that members of the staff were impressed with the large number of mental patients who were diagnosed dementia praecox and who later recovered or improved to the extent that they could be released on their own responsibility. It was believed in retrospect that these were cases of depression of a mixed type which could not be differentiated from dementia praecox until they had been under observation for some time.<sup>1</sup>

Thornton and Brown in relating the experience in France at Base Hospital No. 8 for mental patients from the A.E.F. described a group of cases which they named "war psychoses" because they presented many common symptoms and were different from the psychoses observed in civilian life. They estimated that one-fifth of all the psychoses fell into this group. On admission they were dazed, confused, and disoriented and as a rule were not accessible during the acute period. They generally thought themselves at the front under fire and were anxious and apprehensive. They wandered about rather aimlessly and showed bewilderment and confusion. As a rule they were depressed and at times actively suicidal. Some had hallucinations. Many improved while in the hospital and it was thought that the acute symptoms had probably disappeared by the time they reached the United States.<sup>2</sup>

More recently Duval and Hoffman found significant differences between dementia praecox in military life and in civil life.<sup>3</sup> In a considerable proportion of military patients the onset was more abrupt, the course more tempestuous, the situational factors more important and more direct in their action, and

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1. Williams, Frankwood E.: Observation and Treatment, in *The Medical Department of the United States Army in the World War; Neuropsychiatry*, vol. 10, p. 128. Washington, D. C.: U. S. Government Printing Office, 1929.

2. Thornton, M. J., and Brown, Sanger: *The Care and Disposition of Cases of Mental Disease, in The Medical Department of the United States Army in the World War; Neuropsychiatry*, vol. 10, pp. 414-415. Washington, D. C.: U. S. Government Printing Office, 1929.

3. Duval, Addison M., and Hoffman, Jay L.: *Dementia Praecox in Military Life as Compared with Dementia Praecox in Civil Life*, *War Medicine*, 1:854-862, November 1941.

the immediate and ultimate prognosis more favorable. Forty-seven percent of their cases were well enough in a few months to be discharged from the hospital. They believed that these cases constituted a borderline group between dementia praecox and hysteria.

A group of cases of schizophrenic-like psychoses occurring with emotional stress in civilian life and ending in recovery was described by Paskind and Brown.<sup>4</sup> Their cases differed from the classical picture of schizophrenia in that there was emotional stress at time of onset, the onset was rapid, disorientation was frequent, amnesia for the period of the psychoses was common, and recovery was usual. These authors suggested that this syndrome did not properly belong in the category of schizophrenia but was a separate nosologic entity. Parsons<sup>5</sup> reported that of 33 schizophrenic patients seen on the neuropsychiatric service of a general hospital, one-third had made a rapid recovery and an additional third had shown marked improvement.

A more rapid recovery rate for psychoses occurring in the British Army has also been observed. Rees, consultant psychiatrist for the British Army, has written "as in the Middle East, there seems at home to be some evidence that the psychotic breakdown in the services clears up rather more quickly and satisfactorily than in the equivalent age groups in civilian life. Some 95 percent of psychotic patients in military mental hospitals are returned to the care of relatives as recovered or to public assistance institutions, and the remaining 5 percent are discharged to civilian mental hospitals."<sup>6</sup> Klow<sup>7</sup> published observations on servicemen admitted to the Elgin State Hospital. The benign course in many of the patients who had been labeled dementia praecox prompted him to question the diagnosis.

Since the present group of cases was heterogeneous, we cannot compare the results to those reported by other workers. Included in our series were cases of psychoses secondary to mental deficiency and to psychopathic personalities. The prognosis for recovery from psychoses in these conditions is

4. Paskind, Harry A., and Brown, Meyer: Psychoses Resembling Schizophrenia Occurring with Emotional Stress and Ending in Recovery, *Am. J. Psychiat.*, 96:1379-1388, May 1940.

5. Parsons, E. H.: Military Neuropsychiatry in the Present War, *Ann. Int. M.*, 18:935-940, June 1943.

6. Rees, J. R.: Three Years of Military Psychiatry in the United Kingdom, *Brit. M. J.*, 1:1-6, 2 Jan. 1943.

7. Klow, S. D.: Acute Psychosis in Selectees, *Illinois M. J.*, 83:125-130, February 1943.



notably good and this may in part account for the edifying findings of this follow-up study.

In contrast to what others have described, no uniform mode of psychotic reaction has been observed in these cases which would confirm the existence of a specific war psychosis or borderline group. Nor has there been any unusual prominence of sex factors in a consideration of precipitating causes. The onset of the disease in the acute cases seemed to be adequately explained as a total reaction of the individual characterized by accentuation of premorbid personality traits in response to a pronounced environment change and sudden intensification of self-preservatory mechanisms.

TABLE VI  
*Patients still under treatment*

State hospital .....	20
Veterans' hospital .....	14
Private physician { for mental condition .....	14
{ for other condition .....	2
State hospital outpatient clinic .....	1
Total .....	51

#### SUMMARY

In a follow-up study on 183 soldiers discharged from the military service because of psychoses, 62 were reported by their families as having completely recovered. Seventy-seven were working full time and 29 part time. Only 34 still required hospital care and 15 others were under the care of private physicians.

The data on this group indicates that psychoses observed in the Army do not carry as grave a prognosis as the similar types developing in civilian life.

**Edible Plants of the Arctic Region.**—In a booklet on this subject prepared by Paul C. Standley, Curator of the Herbarium, Field Museum of Natural History, and issued by the United States Navy Bureau of Medicine and Surgery, it is said that no arctic plants are poisonous to the touch and all berries or fruits may be eaten without fear of internal poisoning. But all kinds of greens should be avoided after being frosted, because dangerous poisons develop in some of them. A few plants of the carrot or parsnip family may be poisonous, so they should be tasted in very small quantities. In some cases the bitter or aromatic taste is sufficient warning. Some species of lichens cause nausea unless they are boiled or soaked thoroughly before eating.

# Apparatus and Clinical Notes

## ROCKY MOUNTAIN SPOTTED FEVER

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Rocky Mountain spotted fever was unknown in eastern United States until 1930.<sup>1</sup> It was recognized in Alabama in 1934, since when sixteen additional cases have occurred in that state.<sup>2,3</sup> We observed at Fort McClellan, Alabama, in 1943, two proved cases, the first to be reported from this immediate vicinity. A third probable case also was observed.

### Report of Cases

CASE 1. A 20-year old white male was admitted to the station hospital on 3 June 1943, complaining of cough and headache of three days' duration, chills, fever, weakness, and nausea. For twelve days the patient had been in the Morrisville area, about fifteen miles from the post. The symptoms became progressively worse until admission. Careful inquiry failed to elicit any history of tick bite.

The patient was acutely ill with flushed, anxious facies and a dusky maculopapular skin eruption about the lower chest, abdomen, and upper thighs. One lesion over the right thigh was ecchymotic. The conjunctivae were injected, and the pharynx reddened and congested. There was no nuchal rigidity. A few small lymph nodes were present in the inguinal regions. Deep and superficial reflexes were equal and active. The temperature, pulse, and respiration were within normal limits, but despite these findings the patient appeared acutely ill and exhibited a peculiar sighing respiration.

The white blood cell count was 5,250 with 79 percent polymorphonuclears, 18 percent lymphocytes, and 3 percent monocytes. The red count was 4,770,000 and the Hg. 16.8 gm. The urine showed 1+ albumin and an occasional white blood cell.

In about ten hours, the temperature rose to 103.8° F. and remained high throughout the febrile stage with morning remissions assuming a double spiked character ranging from 100° F. to 106° F. The pulse and respiration varied with the temperature but were not disproportionately increased. Toward the end of the third week the temperature dropped by lysis. A moderate secondary rise occurred during the following week.

The rash progressed steadily, became petechial, and spread peripherally to involve the extremities, including palms and soles by the ninth day (figures 1 and 2). A Rumpel-Leede test at this time was positive. On the tenth day facial edema was observed. Petechiae were noted on the soft palate, buccal mucosa, the scrotum, and penis. The latter subsequently became ecchymotic and necrotic and several superficial ulcerations ensued. The rash began to fade about the end of the third week and the scrotal ulcerations showed signs of healing. During convalescence, however, the eruption was evident as a brownish mottling, particularly on the dependent parts of the body.

Dr. G. G. Gill of the Alabama State Department of Health assisted in the preparation of this paper.

1. Hampton, B. C., and Eubank, H. G.: Rocky Mountain Spotted Fever; Geographical and Seasonal Prevalence, Case Fatality, and Preventive Measures, Pub. Health Rep., Wash., 53:984-990, 17 June 1938.

2. Dunn, J. E.: Personal communication to the authors.

3. Virus and Rickettsial Diseases, A Symposium at the Harvard School of Public Health, 12 to 17 June 1939, University Press.

The patient became more apprehensive and confused. He was stuporous, difficult to arouse, resented being disturbed, became disoriented at times, mumbled incoherently, and failed to recognize members of his family. This confusion persisted until the twenty-fifth day, when the patient began to take an interest in his surroundings.

On the twelfth day of illness urinary retention was noted. He required catheterization every ten hours. Three days later some impairment of motion of the lower extremities was manifest. The urinary disturbance and the paraparesis became progressively worse until a definite paraplegia was apparent. There was muscular wasting of his entire lower extremities, a bilateral Babinski sign and loss of abdominal and cremasteric reflexes. The deep reflexes remained intact at first but gradually disappeared until they could barely be obtained by reinforcement. Motor power returned

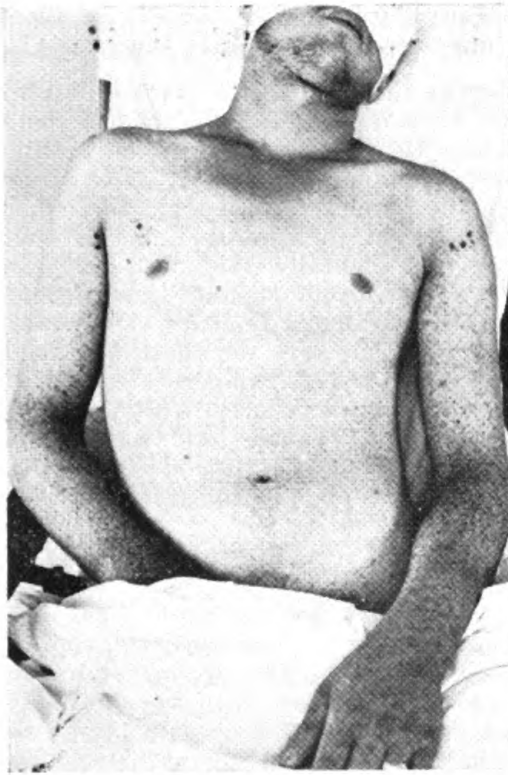


FIGURE 1

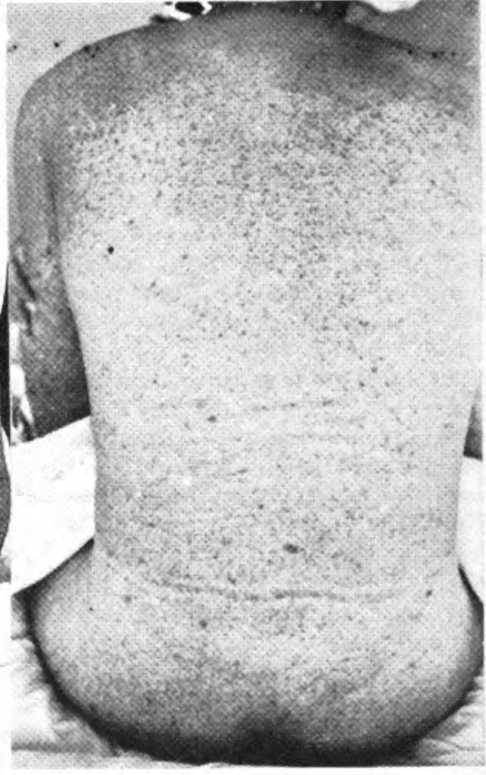


FIGURE 2

slowly, together with voluntary bladder action about seventeen days after onset of the neurologic signs. Two weeks later the patient took a few steps with assistance. His gait was spastic. By the eighth week he began to walk alone and complete recovery of central nervous system involvement was evident. Throughout this period the patient had a severe cystitis manifested by albuminuria and pyuria which gradually cleared during convalescence.

Nausea and vomiting were predominant at the onset, but by the tenth day an uncontrollable diarrhea with incontinence developed and lasted one week. Anorexia persisted until definite recovery began. A hacking non-productive cough was present for the first few days but no abnormal physical signs were demonstrable. Repeated x-rays of the chest were negative. The white blood count varied from 3,600 on the eighth day of

Photographs by U. S. Army Signal Corps.

illness to 13,850 which was recorded on the twenty-fourth day, during the secondary elevation of temperature. The average count was about 6,500. The hemoglobin varied from 16.8 gm. on admission to 10.9 gm. on the fifteenth day when iron therapy was instituted. Following this, there was a gradual rise of hemoglobin to normal before discharge. The red cell count variation was proportionate to the hemoglobin.

The Weil-Felix reactions were as follows: agglutinations for *B. Proteus* OX-19 negative on 4 and 7 June; positive in 1:80 dilution on the 9th and 10th; 1:640 on the 14th; 1:1,280 on the 18th; and 1:2,560 on 1 July. Agglutination for OX-2 was negative on the 9th, positive in 1:40 dilution on the 10th, 1:80 on the 14th, and 1:40 on the 18th.

The complement-fixation test was negative for typhus and positive, in 1:512 dilution, for Rocky Mountain spotted fever. The spinal fluid on 7 June contained 30 white blood cells with 91 percent polymorphonuclears and 9 percent lymphocytes. No organisms were found by smear or culture. Blood cultures were negative on 3, 7, and 9 June. Icterus index on 14 June was 13.2.

CASE 2. A 21-year old white male was admitted to the station hospital on 15 July 1943, complaining of chilly sensations, fever, backaches, weakness, and fatigue of two days' duration. He vomited once in the evening preceding admission without any other abdominal complaints. After spending two weeks in the Morrisville area, the patient returned to the post on 10 July, five days prior to admission. Careful questioning failed to elicit any history of tick bites. He was acutely ill, mentally clear, well developed and well nourished. A few scattered, reddish maculopapular lesions which faded on pressure were present over the trunk and extremities. There were slight nasal congestion, an occasional coarse rale over the chest, and small nontender submaxillary, axillary, and inguinal nodes. Temperature, 103° F.; pulse, 100; respiration, 22. The white blood count was 10,050 with 83 percent polymorphonuclears. Hemoglobin was 14.1 gm. Spinal fluid was normal except for a colloidal gold curve which was 111000000. Blood culture was negative. Repeated chest x-rays revealed no explanation for the chest findings.

The temperature was spiking in character, reaching 103° F. to 104° F. daily, associated with intermittent chilly sensations. The pulse was proportional to the temperature. The respirations became rapid. The skin lesions increased in number and prominence, new crops appearing on the palms and soles which rapidly became petechial. The upper respiratory symptoms continued and a slightly productive cough with no significant change in the chest findings developed. The spleen became palpable on the third hospital day. Two days later slight nuchal rigidity was noticed and lumbar puncture revealed a clear fluid under slightly increased pressure. Between the sixth and tenth hospital day, the patient became progressively weaker and stuporous. His chief concern was general muscular pain, particularly of the back and legs. At this time he had increased muscle tonus (without any change in reflexes) so marked that some observers believed he was manifesting signs of tetany. Mental signs and symptoms predominated throughout the second and third weeks and on into convalescence, with hallucinations, carphologia, euphoria, silliness, incoherence, and unreliability. Improvement was first noted on the eleventh hospital day, manifested by transitory, lucid intervals, during which he was cognizant of the surroundings. The rash began to fade on the fifteenth hospital day but was still noticeable about one month after admission. The temperature dropped by lysis at the end of the third week, following which the patient steadily improved. He was transferred to a general hospital where the mental symptoms persisted. At the latest report, he had failed to regain his previous mental status.

On 1 August his serum agglutinated *B. Proteus* OX-19 in dilutions up to 1:640; by 10 August this had risen to 1:1,280 and on 11 September it dropped to 1:640. At this time agglutination for the OX-2 strain of *B. Proteus* was negative.

The first complement-fixation test on 10 August by the National Institute of Health was negative for endemic typhus but positive for Rocky Mountain spotted fever, in dilution of 1:246. A second test on 11 September by the Army Virus Laboratory was negative for typhus and positive for Rocky Mountain spotted fever. Agglutination tests for tularemia and undulant fever were negative on 1 August.

CASE 3. A 21-year old white male was admitted to the station hospital on 25 August 1943, complaining of severe headache, cough, and joint and muscle pains. The patient had been under antiluetic therapy for the last two years. About one month before admission he spent two weeks in the Morrisville area. During this period, he discovered a tick on his leg and, in removing it, crushed the tick. The patient was acutely ill with temperature, pulse, and respiration of 102.2° F., 112, and 36, respectively. The sensorium was clouded. He had difficulty in remembering facts. An erythematous macular rash was present over the body including the palms and soles. The conjunctivae were injected. His white blood count was 10,050 with 77 percent polymorphonuclears. The red blood count was 4,560,000 and the hemoglobin 15.3 gm. Urine showed 1+ albumin. The temperature was a spiking type, varying from 99° F. to 103° F. daily for the first four days. On the fifth day, the temperature did not exceed 99° F. and was normal thereafter. His antiluetic regimen was not interrupted, the patient receiving 0.06 gm. of mapharsen each week. Subsequent white blood count averaged 10,000 with a normal differential.

Agglutination tests on 17 September gave the following results: *B. Proteus* OX-19 was agglutinated in titers up to 1:80 and OX-2 up to 1:160. The complement-fixation test was positive for Rocky Mountain spotted fever in dilution of 1:16 and for endemic typhus in 1:4. Three weeks later Rocky Mountain spotted fever was still positive in dilution of 1:8, but endemic typhus was negative. Meanwhile, agglutination with *B. Proteus* OX-19 had risen to 1:320. Agglutinations for tularemia and undulant fever were negative.

#### Discussion

Rocky Mountain spotted fever is prevalent most commonly during the summer in this section of the country.<sup>1</sup> The cases reported occurred during this season. The patients were all exposed in the Morrisville area, but only case 3 gave a history of contact with ticks. The prodromata-anorexia, vomiting, headache, chilly sensations, and malaise followed the usual description.<sup>3,4</sup> A presumptive diagnosis of typhus was made in case 1, but this seemed unlikely when the patient's temperature remained normal for about twelve hours. His rash was centrally located which is at variance with the known initial peripheral distribution. This patient showed the peculiar type of respiration found in acute anxiety states; namely, rapid, shallow breathing with difficulty to obtain a deep breath. The liver was not enlarged in any of these cases. Only in case 2 was the spleen palpated. Case 1 showed an intractable diarrhea with fecal incontinence for three days, whereas constipation<sup>4,5</sup> is commonly noted in this disease. His white blood count varied from 3,600 to 13,850, averaging 6,500 with moderately increased polymorphonuclears. This is not a usual finding although leuko-

4. Cecil, R. L. (editor): A Textbook of Medicine, pages 106-113. Philadelphia: W. B. Saunders Co., 1940.

5. Baker, G. E.: Rocky Mountain Spotted Fever, Ann. Int. M., 17:247-269, Aug. 1942.

penia has been described especially in children.<sup>6</sup> The only elevated white count was obtained while the patient was suffering from severe cystitis.

Case 3 poses many difficulties despite the fairly obvious clinical evolution. The evidence for Rocky Mountain spotted fever is not conclusive. The history of contact with a tick, characteristic onset, distribution of rash, mental clouding, normal white blood count, and suggestive Weil-Felix agglutinations support this diagnosis. Against it, are the equivocal results of the complement-fixation tests. If the suspected diagnosis was correct, other problems arise. Was the course attenuated by antiluetic therapy? This factor must be considered in view of Baker's<sup>5</sup> report on the beneficial effects of intravenous arsenical and metaphen in the treatment of Rocky Mountain spotted fever. Obviously antiluetic therapy did not prevent the disease. Moreover, abortive cases of this disease occur and ours may well be in that group.

The extent of the neurologic and mental manifestations in case 1 and the duration of mental symptoms in case 2 with recovery in both are worthy of note. Similar findings were not mentioned in any recent article reviewed. According to Baker,<sup>5</sup> complicated cases usually terminate fatally.

The limitation of the Weil-Felix agglutination test in the differential diagnosis of rickettsial diseases is illustrated in these cases. The selective agglutination of *B. Proteus* OX-19 and OX-2 strains is commonly considered helpful in differentiating between endemic typhus and Rocky Mountain spotted fever, respectively. Exactly contradictory results were obtained in our two proved cases wherein the agglutination for OX-19 was of a higher titer than for OX-2. In our third case in which doubt exists as to the diagnosis, the agglutination followed those usually described.

6. Ong, H. A., and Raffetto, J. F.: Rocky Mountain Spotted Fever. Analysis of 18 Cases in Children, *J. Pediat.*, St. Louis, 27:647-653, Nov. 1940.

### CONSTRUCTING A MICRO-PROJECTOR

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Medical Corps, Army of the United States

CAPTAIN A. S. KOENIG

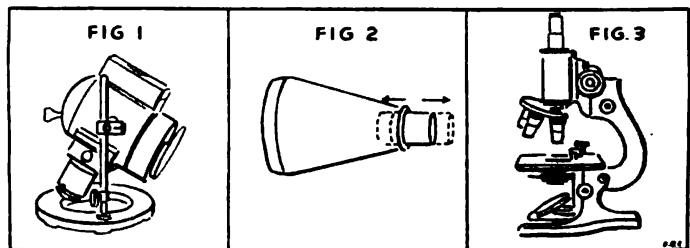
Medical Corps, Army of the United States  
and

FIRST LIEUT. MARK M. LUCKENS  
Sanitary Corps, Army of the United States

A satisfactory projector for microscopic slides can be made of materials available at most laboratories. The equipment needed consists of a triple objective monocular microscope (figure 3) with an Abbé condenser and a mechanical stage. The source of light is a microscope lamp (figure 1) manufactured by the Spencer Lens Co., Model 370. Both of these instruments are standard items in the U. S. Army Medical Department Supply Catalog.

The microscope lamp contains a screw socket for its bulb. The socket must be altered by removing the threaded metal portion and substituting an

adapter so that a standard 300-watt cylindrical movie projector bulb can be inserted. This can easily be done by an electrician or handy man. The housing of the lamp permits sufficient cooling of a 300-watt bulb but is not adequate for one of greater intensity.

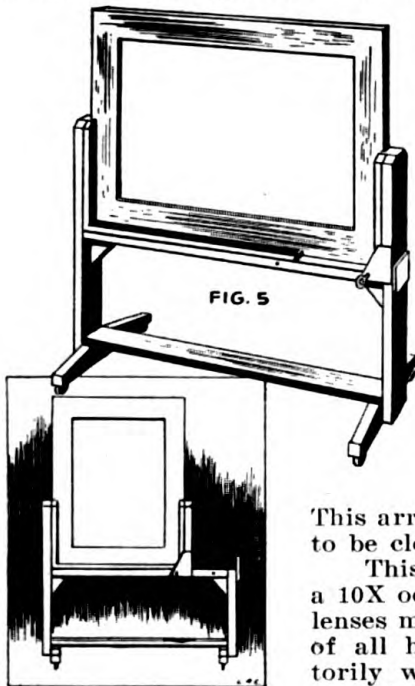
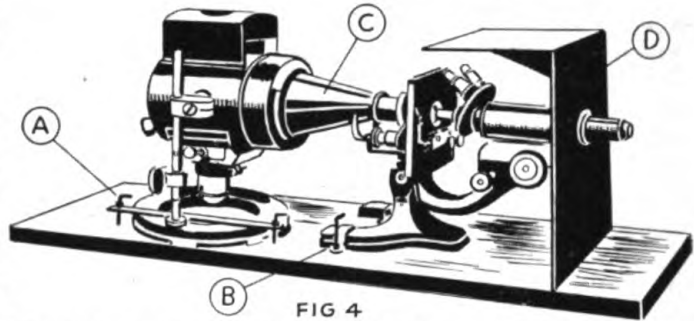


The lamp and microscope are fastened to a board, 30 by 7 inches (figure 4), by means of steel bands over the base of the lamp (A) and the base of the microscope (B). The bands are fixed to the board with thumb-screws which may easily be removed when the apparatus is to be dismantled.

The microscope is tilted so that the tube is horizontal, and the substage reflecting mirror is removed, permitting a direct beam of light to pass from the lamp through the lens system of the microscope. With this arrangement the lamp may be adjusted to focus the light at its maximum intensity.

To eliminate loss of light between the lamp and condenser, a sheet metal cone (figure 2 and figure 4(C)) was constructed. The larger opening of the cone fits snugly into the metal rim ordinarily used to hold a blue filter glass at the aperture of the microscope lamp. Into the smaller opening is telescoped a metal cylinder with an outside diameter sufficiently large to effect a snug fit into a corresponding metal rim beneath the Abbé condenser. This arrangement permits focusing of the condenser to alter the intensity of light.

As in most micro-projectors, there is a moderate scattering of light between the slide and the objective lens. The additional light interferes with the projected image but it can be largely eliminated by means of an inverted L-shaped piece of sheet metal (figure 4(D)) the vertical portion 9 by 7 inches, the horizontal portion extending 6 inches over the tube of the microscope. There is a hole in the vertical portion which permits this shield to be slipped over the ocular of the microscope. The base of the shield fits into a sawed groove in the board, thus fixing it in place.



A piece of 30-inch wide draughtsman's tracing linen is stretched over a wooden frame with over-all dimensions of 36 by 32 inches to form a screen 33 by 23½ inches. As shown in figure 5, the frame is mounted in a stand which may be adjusted so that the screen can be placed in either a vertical or horizontal position. The dimensions of the stand may be such as to suit requirements, following the pattern illustrated.

When in use the image is projected on the coarse-grained surface of the screen and viewed from the other side. We have found that in this way the image seen is more distinct and there is no interference from the small amount of dispersed light from the projector.

This arrangement permits those viewing the image to be closer to the screen.

This apparatus is most satisfactory when using a 10X ocular lens in the microscope. The objective lenses may either be low or high dry power. Slides of all histologic tissues may be shown satisfactorily with the projector described, provided the room is in absolute darkness.



## AN AUTOMATIC PIPETTE WASHER

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and

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The automatic washers and rinsers of pipettes available from scientific supply houses are generally elaborate and expensive pieces of equipment. The one in use in this laboratory for two years was devised before the commercial type was known to the authors. Such a device saves time for the technician and reduces breakage of pipettes. While two similar rinsers have been described,<sup>1,2</sup> the one described here is especially adaptable to military installations and it can be made from materials that are readily available and frequently found in salvage.

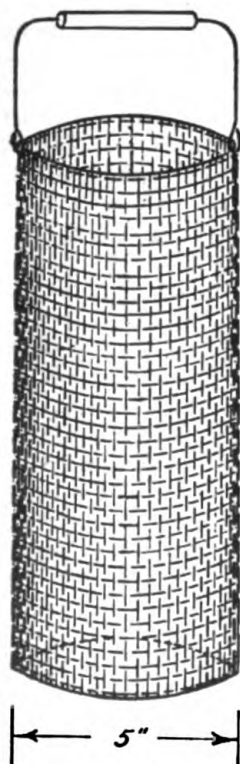


FIGURE 2. Pipette basket.

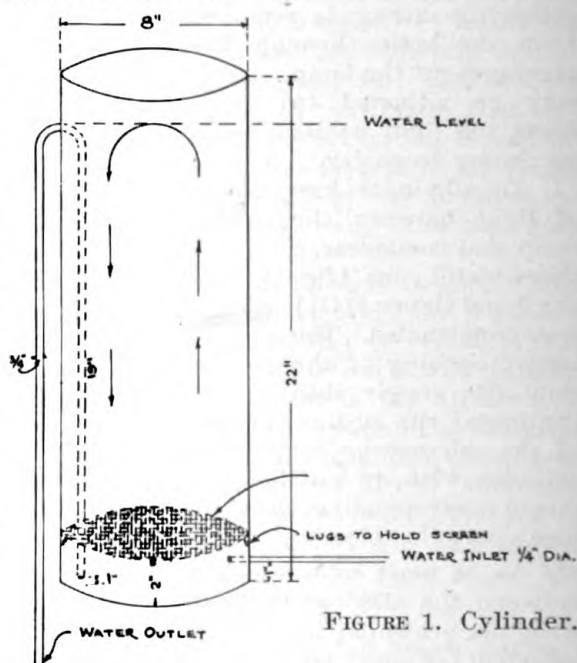


FIGURE 1. Cylinder.

Figure 1 shows by diagram the cylinder of the washer. For appearance and ease in cleaning, it is covered with black enamel paint. Figure 2 is the holder for pipettes made from galvanized screen wire,  $\frac{1}{4}$ -inch mesh, 5 inches in diameter and 12 inches high. A wire handle is attached for removing the pipettes from the washer.

## Principle

Water enters through a  $\frac{1}{4}$ -inch tap in the 12" bottom connected with the water supply and fills the container and the inside portion of the siphon which is a  $\frac{3}{4}$ -inch metal tube. As the tube fills, the siphon begins to empty the container until the siphon is "broken" by the water reaching a lower level than the siphon intake. Careful adjustment of the water flow is not essential to the complete and rapid emptying of the rinser because the inlet pipe is  $\frac{1}{4}$  inch and the siphon tube is  $\frac{3}{4}$  inch. One complete rinsing in this washer requires six to eight minutes. After being rinsed the desired number of times, the pipettes are removed in the basket and allowed to drain dry.

The original cost is only a few dollars. The saving effected in man-hours of labor and in reducing breakage by this device may amount to several hundred dollars annually.

1. Boehm, E. E., and Myers, E. E.: Pipet Rinser, *Am. J. Clin. Path., Tech. Supp.*, Vol. 13, No. 7, pp. 71, July 1943.
2. Wise, I. M.: Homemade Pipet Washer, *Am. J. Clin. Path., Tech. Supp.*, Vol. 14, No. 1, p. 16, Jan. 1944.



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Carlisle Barracks. Pa., 7-3-44—75,000

